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THE NATURE OF THE LARYNGEAL VIBRATION

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While I was examining a girl who showed atrophy of the left vocal fold, the question arose in my mind as to the physical difference between the sound waves produced by such a larynx and those generated by a normally balanced pair of vocal folds. Further, the question presented itself as to whether the bands vibrated in parallel or in opposite phase; that is, when the right band is outwardly and upwardly displaced, is the left in a similar position or in the exactly opposite position? If the two bands vibrate alternately, is the perceived pitch that of the frequency of one band (either the right or the left), or is it of the combined frequency of both bands?

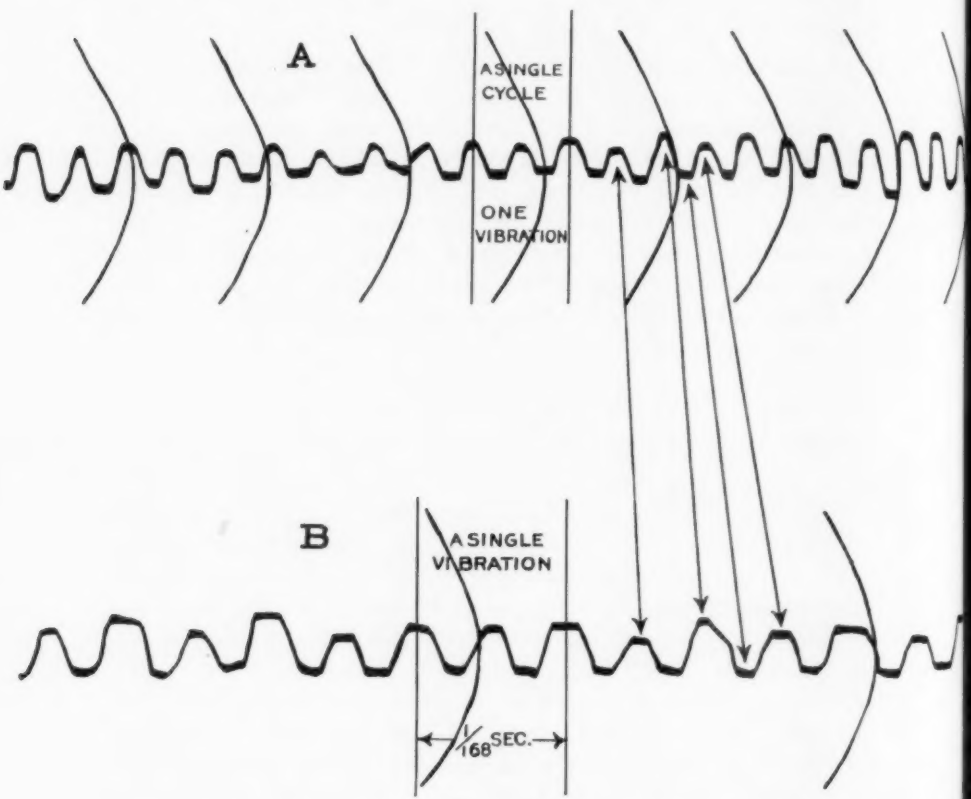
MOVEMENTS OF SURFACE OF LARYNX DURING PHONATION

The first approach to the answer to these questions was the study of the movements of the surface of the larynx during phonation. A modification of the magnetophonograph was employed. This is an instrument for recording sounds of various kinds. In order to study the movements of the larynx, rather than the sounds produced by the larynx, a modification of the transmitter or microphone was necessary. To meet this requirement a stethoscope was substituted for the receiver of the microphone.

The type of stethoscope employed was that usually used for sphygmomanometry. It has a diaphragm, on the center of which is a button, which is pressed on the surface to be studied. This instrument was adapted by removal of the aural tubes so that it could be inserted into the opening of the microphone in place of the mouthpiece.

The point of the thyroid cartilage (that is, of the Adam's apple) was selected as the point on which to apply the stethoscope, for that point is nearest to the anterior attachment of vocal bands. A technic was developed for timing and photographing the curves produced by the movements of the thyroid cartilage, which are, in turn, presumably caused by the vibration of the vocal folds. If anything can be learned of the movements of the two bands from studying the movements of the point to which they are attached, the apparatus is ready for such investigation.

When the curves of the experimenter's own laryngeal movements were first produced it was at once evident that for every wave of what was perceived as the fundamental, there were two laryngeal movements; that is, if the voice were made to sound in unison with a fork of a frequency of 128 vibrations per second, the curve would show two "humps," or maxima, for every interval of $\frac{1}{128}$ of a second (see illustration). An attempt to view the larynx internally with a strobolaryngoscope failed to reveal the reason for this double movement. There are three



Magnetophonophotographs showing movements of the larynx during phonation. *A* is a tracing made from the outside of the human larynx. *B* is a tracing made from the outside of the artificial larynx. The intersecting lines are time lines. The sound uttered in A was (a), as in so*fa*. Note the similarity between the two curves. These tracings are engraver's positives made from the original negatives.

reasons for this failure: (*a*) the technical difficulty of timing the stroboscope and the voice in unison and of holding the two at the same frequency long enough to make observations; (*b*) the technical difficulty of making observations that include enough of the walls of the larynx to give an adequate idea of what effect the changes of air pressure and

muscle tension have on them; (*c*) the difficulty of determining what the ratio is between the stroboscopic exposures and the movements under observation. Under the conditions of strobolaryngoscopy at its best the difference in appearance between a structure vibrating at a ratio of 1 with respect to the stroboscope and another vibrating at a ratio of one half is difficult to recognize. Hence reasonable deductions as to the frequency of movements under observation could not be drawn.

Experiments with Artificial Larynx.—Because of the difficulty of making a satisfactory visual observation of the larynx in action, it seemed expedient to construct an artificial larynx. A piece of pasteboard tubing about 4 cm. in diameter was capped at one end by a taut tympan of thin rubber, slit once across its entire diameter so as to produce two edges capable of vibration. The other end of the tube was attached to a short piece of flexible rubber tubing, so that the experimenter could send a blast of air through the device and watch its effect on the edges of the slit in the rubber tympan. This device was tested as to its functional similarity to the human larynx by taking magnetophonographic tracings. The stethoscopic button was pressed against the side of the pasteboard tubing near the end of the slit in the rubber cap. The tracings were found to be interestingly similar, each curve showing the characteristic double maximum.

Visual examination of the vibrating "vocal bands" of the artificial larynx showed at first inspection a fuzziness or indistinctness across the entire slit, more pronounced near the midpoint and less so near the ends. In order better to examine these vibrations a small electric light was fitted into the "larynx" to illuminate the interior. The device was then tested in the dark room. If the "larynx" was held with the rubber cap level and slightly below the eyes with the slit at right angles to the line of vision, the vibrating edges presented an apparently continuous view of the lighted interior of the larynx. The opening seemed to be a pointed ellipse, showing that at some phase, at least, of each vibration the farther band was forced upward, while the nearer was in a downward position. The "larynx" was then turned around so as to present an exactly similar view with the edges reversed. The same phenomenon was observed.

Viewed through a stroboscopic disk these elliptical openings showed certain modifications. Although the view of the lighter interior of the "larynx" was still apparent from both of the aspects described, yet the stroboscope did not catch the bands at any phase in which their position revealed a pointed ellipse of light. Rather, the view of the interior began at one end of the slit and proceeded along the slit. By the time the movement had reached one end of the slit, closure of the edges had taken place at the opposite end. Under stroboscopic examination the most conspicuous phenomenon was that of closing edges apparently moving across the field of light.

From these observations it seemed clear that the vibrations of the artificial larynx were not parallel, but were opposite in phase; that is, the movements of the two bands were exactly similar, but the beginning of the period of the movement of one band took place at mid-phase of the movement of the other. It was apparent, moreover, that each band moved, not as a whole, but in nodes traveling along the edge.

In view of the similarity between the tracings from the artificial larynx and those of the human larynx, is it justifiable to assume that in the human organ the vocal bands also vibrate exactly in opposite phase? The fundamental objection to such an assumption is that the bands of one organ are dead rubber and those of the other are living tissue, over-lying and attached to musculature capable of movements independent of those produced by the force of the air current. There is no reason, on the other hand, to suppose that this difference of material would cause a difference in phase; but an argument based on similarity is weakened if there exists any doubt as to the essential nature of the parallel.

It was found possible to produce vibrations by blowing between the fingers. The most effective vibrating edges in my hand were those formed by the tissue over-lying the first and second metarcarpals. Movements produced by blowing on these edges were watched in a dark room with the hand illuminated by a stroboscopic light and with a mirror to reflect the image back into my eyes. The movements were of the same nature as with the artificial larynx.

This experiment was again tried by blowing through a metal ring about the shape and size of the outer rim of the mouthpiece of a bass tuba. The edges of the lips were seen to vibrate in close similarity to the vibrations of the rubber "vocal bands" of the artificial larynx. In this case the vibrating edges are structurally so similar to those of the true vocal bands that the German scientists have adopted for the latter the name of "voice lips" (Stimmelippen). As in the true vocal band, each lip presents a strip of muscle parallel to its edge covered by a moist integument.

Experiment with Cadaver's Larynx.—The next experiment was with the larynx of a cadaver. A large larynx from the body of an old man was separated from its adjacent structures and cut away superiorly to a line parallel to and about 5 mm. above the vocal bands. The stump of the trachea was mounted on a piece of flexible rubber tubing so that a blast of air could be driven through the larynx. Its edges showed the same characteristics of vibration as did the artificial larynx.

SHIFTING OF AIR PRESSURE

As a problem in theoretical hydrostatics (for it is safe to treat a gas in motion as a liquid so long as its coefficient of expansion is not

one of the factors involved in the problem) the question may be stated thus: given a stream of air flowing through a tube (trachea) into a larger open air space (pharynx); at the point at which the tube gives egress into the larger air space there is a narrowing of the tube (larynx) across one diameter such that the air must pass out between two elastic edges closely approximated one to the other (vocal bands); if the approximation is so close and the force of the air so great as to produce a vibration in the elastic edges, what would be the nature of the vibrations as regards their phases? As an analogue to this situation there is the "eddy" phenomenon of hydrostatics. If a swiftly moving stream is blocked by a dam, at the middle of which a narrow orifice is cut, eddy currents (see figure) or whirls of water will form in the downstream angle between the dam and the direction of the flow. On the right the whirl will be clockwise and on the left counter-clockwise. After each eddy has formed it will break away from the edge of the dam and be carried downstream until friction with the water around it has overcome its whirling motion. But the eddy on the right never breaks away simultaneously with that on the left. They exactly alternate. The explanation is that the pressure of the entire body of escaping water shifts from side to side. If, then, the edges of the dam were elastic, they would be constantly bulged downstream, but would yield upstream whenever a strong whirl of water was formed below them to offset the downward force of the water, and consequently would yield alternately. This is precisely the condition in the larynx.

Consider another analogue illustrative of this shifting tendency of the force of a partly blocked stream. A strip of paper, of any convenient length and about 2 cm. in width, is held so that one of its shorter edges cuts the middle of the stream of air emerging from between the pursed lips. Vigorous blowing causes vibrations of the paper. It is on this principle that children produce a tone by blowing on a blade of grass held between their thumbs so that its edge cuts the middle of the blast of air. If the air emerged from between the pursed lips in a steady, nonoscillating stream, the paper or the blade of grass would probably be blown to one side or the other and would doubtless remain there. The force of the air current in "midstream" would prevent the paper or grass from returning to its initial position. That such a return does take place is evidence that the area of greatest air pressure does not remain constantly in midstream, but oscillates from side to side. As this area moves back and forth it causes a corresponding movement (but in the opposite direction) of the edges of the paper or the grass. Two bands jutting from either side of the opening through which the air emerges may be substituted for the single edge of paper placed so as to cut the blast of air in midstream. As the area of highest pressure shifts from side to side, first one band and then the other will be caught and outwardly displaced.

That such an alternate shifting of the pressure of air from side to side would take place in the larynx seems more probable when the events leading up to phonation are traced. It would seem that there are factors in the larynx predisposing to such behavior, in addition to those producing the eddy currents around an inflexible dam. In the larynx, at the beginning of phonation, a strong blast of air is driven up through the glottis. The abductor muscles draw the bands gradually but swiftly together. It is not to be supposed that the right and left abductors are equal in strength, since disparity in size and force in paired organs seems to be the general rule throughout the body. Nor is it to be supposed that the two bands are held at equal tension or that they are exactly equal in size, or that the opening between them is placed exactly in the middle of the air stream. Only a clinical laryngologist can appreciate how rarely even structural symmetry is discovered in the throat, to say nothing of functional symmetry. It is likely, then, that as the pressure below the bands increases, one of them will yield before the other. The instant one yields, it relieves the pressure on the other. The first band, being in upward and outward motion, continues until its own elasticity overcomes its momentum. Then it rebounds, and, by pushing downward on the air below it, causes a great rise in pressure on the under surface of the second band, which now must perforce yield. From then on the phonation continues. If the initial vibrations are thus in opposite phase, what later factor could possibly be operative to bring them into parallel phase? To assume that the bands are parallel in phase would require the assumption of some such synchronizing factor, or the much more difficult assumption that the two bands would yield outward and upward at the same instant.

RELATION BETWEEN FUNDAMENTAL VIBRATION AND RESONATING SURFACE

At this point it is necessary to consider the relation between the fundamental vibration and the resonating surface or chamber. So far as a man's voice is concerned, the resonator has the function of responding to both bands when they are vibrating slowly enough, but when their speed is doubled, the resonator has ability to respond to only one of the two vibrating bands. This can be nicely demonstrated by returning to the artificial larynx, in which the cavity of pasteboard tube acts as the resonator. An ordinary open bell stethoscope is used. The bell is removed, so that there is a single small opening connected with both ear pieces. This opening is held slightly above the cap of the artificial larynx. When the larynx is caused to vibrate, the stethoscope tube is moved back and forth across the diameter of the cap, at right angles to the slit. When the tube is held over the right wing of the cap, the tone is of the same pitch as that which one hears when he listens in the usual

manner. When the tube is held over the left wing, so as to receive waves of air only from that band, the pitch of the tone perceived is the same as though one were listening in the normal fashion to both bands. When one carefully approaches the midline, however, a point is found where the pitch is perceived to rise an octave. (This phenomenon will not be apparent if the opening of the tube is too large.) As one crosses that line the pitch again falls. It is clear, therefore, that in normal hearing of such a tone the air waves that reach the ear come as though from one band only. The tube in the experiment just described, being held immediately over the bands, caught little of the resonance; but the ears unaided by such a device received the air waves that the resonance chamber is suited to amplify. Thus a man's pharynx, acting as a resonance chamber for his larynx, selects the frequency to which it will respond. The same can be said of the relation between the tubes of the French horn and the vibrating lips of the musician who plays the horn.

Thus men's voices show the phenomenon of double curves at normal pitch and single curves at high pitch. The voices of women, of girls, of boys before puberty and those of a high pitch in men show single curves. An explanation of the difference must be sought in the one organ of voice that is significantly divergent in men from the norms set by women and children. A man's larynx is on the average about twice as large in anteroposterior dimension as that of the boy just before puberty, while a woman's larynx is only slightly larger than a boy's. Obviously it could not be assumed that in a man the bands are out of phase and in women they are in phase, and thus explain the single curve of the woman's voice.

The explanation must hang on the relationship as to size between the vocal bands and the resonance chamber. That the resonance from the buccal and nasal chambers is not an important factor here is evidenced by the fact that when the mouth is largely closed off as on "ng" as in "sing," the double curve persists, also when the mouth and nose are both open, as in the French nasal sounds, and yet again when the nose is closed off by the palate and the mouth resonance is employed in all of its widely divergent forms. Pharyngeal resonance, then, with perhaps some from the tracheal and bronchial tree, must be the controlling factor that is sought. To state the answer backward, when the pharynx is small enough in relation to the length of the vibrating bands, it is able to respond to both of them (the shorter a resonator, the faster its period of response).

Now what can be said about the adjustment of the component tones produced by the two vocal bands? That the tones do not neutralize each other is evident without further demonstration. They are heard; that is sufficient evidence. That they do not change the pitch from what

it would be if only one band were vibrating can be inferred from the magnetophonophotographic records. The faculty of perception combines the two tones so as to alter the quality of neither. In their combination, then, the two tones are altered neither in pitch nor in quality. It seems inevitable, however, that the two bands would make a greater disturbance in the air than one, unless the action of one neutralizes that of the other. As the resonator prevents this neutralization, the resultant sound is chiefly altered by an increase in volume from that which would be produced by one band. In some parts of the body one or the other of paired organs seems useless except as a reserve, but in this case both function; but, though functioning alternately, they function as one.

The pubescent boy's voice presents an interesting illustration of this relation between vibrator and resonator. Before puberty his most convenient pitch is that in which his relatively large pharynx (large in relation to his vocal bands) can respond to every complete vibration, that is, to a complete laryngeal cycle of both bands. After puberty, his most convenient pitch is that in which his relatively small pharynx can respond not only to every complete vibration, but also to every intro-vibrational movement. Thus the general range of frequency, that is, the register, is determined by the length of the vocal bands; and the pitch, by the size of the pharynx. These changes come about suddenly. The lad has to learn a new technic of adjusting the larynx to the pharynx, and while he is learning his new technic, he shows the same tendency that a learner on the trombone demonstrates, to slide from one octave to the next. Both can learn more quickly to control the key than to control the register. In some the pubescent change of voice is so sudden as to make the transition stage imperceptible. Two cases of interest here might be cited from my study. One was the case of a boy who continued to talk in the upper register for five years after puberty. After taking certain exercises for relaxation of his throat, his voice changed into a deep bass over night. Another was that of a man whose voice never changed except for sustained or vigorous notes. When he either sang or shouted his voice was bass, otherwise it was the same as before puberty. He was like some trombone players whose notes suddenly shift an octave, if they blow hard.

A man's technic differs from that of women and children in a way that may be easily demonstrated. The finger tip is placed in the narrow V-shaped indenture between the thyroid cartilage and the hyoid bone, that is, just above the Adam's apple. The sound (ah) is intoned, beginning at a low pitch and continuing gradually to a high pitch. It will be noted that in men the thyroid cartilage is drawn backward and upward as the pitch rises, while in women hardly any change takes place in this thyro-hyoid relationship. In the cases of both men and women pharyngoscopic examination during phonation will reveal a general tensing of the constrictor and the levator pharyngeal musculature.

Here again the parallel between the human voice and the wind musical instrument will be noticed. With the human voice, as with the cornet, adjustments in pitch are partly adjustments of the vibrator and partly of the resonator. With the bands in a given tension the particular shade of pitch is dependent on the size of the resonator.

CONCLUSIONS

1. Each cycle of laryngeal vibration consists of one complete movement of each of the two vocal bands, and these two movements are in opposite phase.

2. Vocal sounds are controlled in pitch partly, at least, by the adjustment of the pharynx.

INTRATRACHEAL INHALATION

PRELIMINARY REPORT OF A SIMPLIFIED METHOD OF INTRATRACHEAL ANESTHESIA DEVELOPED UNDER THE SUPERVISION OF DR. CHEVALIER JACKSON

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NEW YORK

In order to make possible extensive intrathoracic operations, the negative pressure cabinet was devised and successfully employed for that purpose. This method was essential in cases of double thoracotomy and valuable in single thoracotomy when adhesions had not formed to prevent the collapse of the lung, as in the case of bullet wounds.

The difficulty of operative procedures under the conditions imposed by the cabinet, coupled with the high cost of installation, led to the work of Meltzer and Auer. The experiments of these investigators brought out the following facts:

The proper exchange of air in the lungs can be accomplished by an almost continuous stream of air passing in one direction. To produce this exchange of air, the stream should be delivered intratracheally through a catheter directed just above the bifurcation of the trachea. The catheter should be less than one-half the size of the glottis, so that obstruction may not be offered to the return flow.

Such a constant intratracheal stream of air should be not less than double the patient's tidal volume, and should be interrupted every thirty seconds, at a pressure of from 15 to 20 mm., warmed, moistened and charged with ether vapor.

In the presence of such a constant, large volume of diluted ether vapor, the normal respiratory efforts are suspended, oxygenation is complete, the circulation is good, and the postoperative effects of the anesthetic are reduced to a minimum.

As I review this method, in which an almost complete elimination of respiratory carbon dioxide was practiced, resulting in prolonged aponea, I find difficulty in reconciling it with the widely accepted observations of Yandell Henderson. One constantly observes that the quality of the circulation is intimately associated with the respiratory act. It is known that the presence of carbon dioxide increases the available oxygen, and that smooth muscle tone is maintained by the proper balance of carbon dioxide. In the light of this knowledge, one is prone to look askance on respiration carried on solely by a diffusion of gases in the absence of respiratory movement.

The method of Meltzer and Auer, a welcome substitute for the negative pressure cabinet and extremely valuable when positive intrathoracic pressure was desired—was soon offered in a perfected form as a routine method of anesthesia for all surgical treatment of the head and neck.

It was observed that the current of air blown into the trachea in its return flow along the sides of the intratracheal catheter had a tendency to prevent foreign material, such as blood, mucus and vomitus, from entering the glottis. The method was therefore urged in operations on the nose and throat, for intestinal obstruction and in other operations. While the normal respiratory efforts were completely or partially held in suspension, exclusion of foreign matter was effective; but latter, when it was found that anesthesia could be satisfactorily carried on in the presence of regular respiratory movement by decreasing the volume of air delivered, complete exclusion of foreign matter did not take place. While using a volume of from 12 to 16 liters of air per minute, at a pressure of 30 mm. delivered deep into the trachea, I have found the distal end of the intratracheal catheter soiled with inspired blood. This is not unreasonable, since a forcible inspiration may yield a negative pressure of more than 50 millimeters.

Substantial and ingenious apparatus for intratracheal insufflation was designed by Janeway, Elsberg, Ehrenfried, Fischer and others. Finally, Karl Connell, seeking to perfect the method, produced his anestheometer, thus achieving accurate measurement of the volume and percentage of ether vapor.

Intratracheal insufflation implies intubation. Two methods are available: the indirect, in which the larynx is not exposed to view, as exemplified by the method of O'Dwyer, Ehrenfried and others; and the direct method, in which the larynx is exposed, as exemplified by the method of Chevalier Jackson.

The advantages, especially the surgical cleanliness, of the latter method quickly brought it to the fore as the routine measure for intratracheal insufflation.

Intubation, however, implied a distinct technic and an electrically illumined apparatus requiring constant care for proper functioning.

Connell found that if the stream of air was delivered into the posterior pharynx at about the level of the epiglottis by catheters passing through the nose, the result in all cases, except in those of thoracotomy, left little to be desired. The normal respiratory rhythm was maintained, and the anestheometer delivered a constant level of maintenance. Accurate pressure regulation, as well as warming and moistening the air, was not so essential; and, finally, it was not necessary to practice intubation.

Intrapharyngeal insufflation soon became a satisfactory routine technic. It offered the best method of ether anesthesia for operations about the head, neck and upper part of the chest.

The method implies, however: first, the proper functioning of an electrically driven ether machine; second, constant attention to provide for the escape of the ether vapor insufflated. While the method does not increase the aspiration of blood or mucus, it does not prevent this difficulty to an appreciable degree. Suction is essential in all forms of operations on the nose and throat by this method. Ether-laden vapor continually escapes from the field of operation, and the surgeon must accommodate his technic to the presence of either oral or nasal tubes. While intrapharyngeal insufflation is eminently safer than chloroform, it is not ideal, even though it provides control, a well oxygenated field for oral and nasal work and a comparatively dry field as well.

The shortcomings of intrapharyngeal insufflation, as well as of intratracheal insufflation, are felt most keenly in oral work and in plastic operations on the face.

Through the courtesy of Dr. J. E. Sheehan, I became acquainted with the work of Magill, of London. He uses intratracheal insufflation in preference to other methods of anesthesia for operations on the nose and throat. Magill has met one of the chief objections to intratracheal insufflation by incorporating a return tube in connection with his intratracheal insufflation tube. This exit tube provides an operative field which is entirely free from the odor of the anesthetic.

In employing Magill's tubes, I was impressed by the combined bulk of the two tubes and the holder, vertical diameter, 16 mm.; transverse, 12.5 mm., which Magill used without trauma to his patients. It occurred to me, therefore, that if a tube of this size was practical, a single tube, which would practically pack the glottis by its presence and permit of ordinary expiration and inspiration through the single lumen, could be used.

In the first edition of my work on anesthesia, I described such a method of intratracheal inhalation. The general lack of knowledge of bronchoscopy in 1915, and the attendant fear of causing trauma by intubation, placed the method on a hypothetical basis. The general acceptance of intratracheal insufflation, which was most popular between 1910 and 1915, postponed the perfection of the inhalation method at that time.

Since 1915, however, the attitude of the medical profession at large toward the technic of bronchoscopy has become greatly modified. Timidity regarding laryngeal and bronchial manipulations has given place to a familiarity with these structures. Apprehension of postoperative trauma to a patient following simple bronchoscopy is no longer

felt, and investigators are fixing their attention on the intricate extraction of foreign bodies from remote portions of the tissue of the lungs. The glottis now appears to be an open door, through which any one skilled in the proper technic may pass unchallenged and without regrets.

There exists today a real need for a simple intratracheal method Intratracheal insufflation, because of its complexity, leaves much to be desired in the cases in which we employ it, and rules it out altogether in borderline cases, such as intestinal obstruction. Intratracheal inhalation furnishes a solution of the problem, provided sufficient ventilation is secured.

Reduced to the simplest terms, the problem has been to determine the diameter of the largest tube which may be intubated and permitted to lie within the cords for a period of at least two hours without producing undesirable postoperative symptoms. Faced with this problem, I naturally turned to Dr. Chevalier Jackson for assistance. With the generosity and the scientific precision which characterize all of his work, Dr. Jackson invited me to his clinic, and offered its facilities to aid in arriving at an accurate conclusion.

Doctor Jackson's opinions are:

An infant a few months old can tolerate a 4 millimeter bronchoscope which is about 5 millimeters outside. In a child of 6 years, we use a 6 millimeter bronchoscope, about 7 millimeters outside. In an adult, we use a 9 millimeter bronchoscope which is about 10 millimeters outside. All of the breathing is done through the bronchoscope when a full size is used.

There is no reaction of any consequence in an operation of as long as two or three hours. There is vastly more reaction from the bubbling back and forth of the ether mucus when ether is given by the open method.

I am no authority whatever on the subject of anesthesia. When it comes to exposure of the larynx, visual examination and the reaction of the mucus, I feel confident to speak.

We have fully determined the matter of the size of your inhalation tube. The largest size catheter, 38 F., will enter the larynx of a man; the next largest size, 32 F., will enter the larynx of a woman. Both of the foregoing are maximum sizes. It is possible that there may be an occasional patient in whom one would be a tight fit, but I do not believe that any harm would be done by leaving a tube of the respective sizes in the larynx for two hours.

In some cases, 32 F. would be necessary for a man's larynx, because of the glottis being somewhat less than the average man's. In any case, a catheter of this size would pass an abundance of air for breathing purposes for any man. His oxidation should be perfect, and his color good.

Of course, if you will use a tightly fitting rubber tube, no secretions will escape down around the tube into the trachea. I would regard it as wise always to aspirate the pharynx clear of secretions of all kinds before the inhalation tube is removed from the larynx. If this is not done, secretions will be aspirated into the larynx just as soon as your anesthesia tube is withdrawn.

It would be advisable to have the larynx of patients examined with a mirror before anesthesia, particularly in every case in which you expect to use your method of intubation. This will protect you against unjust criticism. Patients often have lesions unsuspected in the larynx. For instance, one cord can be paralyzed, and yet the patient may have an excellent voice. The patient may

also have tuberculosis, cancer, papillomas or other lesions. Your tube will do no harm, but it should not be blamed for things it does not do. This examination of the larynx with a mirror becomes doubly important in all cases of goiter, because monolateral paralysis is often present and unsuspected. I should think your method was especially indicated in cases of goiter, because of the fact that these patients every now and then die on the table from obstruction of the airway, due either to paralysis or to some other condition. Your tube would make sure of a clear airway.

The ideas that you have submitted appeal to me strongly. In fact, I see a great future ahead for your tube, provided you develop smoothness and dexterity of technic as far as insertion is concerned.

In order that this method may come into use to the extent which it deserves, it will be necessary for the anesthetist to master the simple technic required to expose the larynx. I feel sure also that shortly after your methods are introduced, someone will try to demonstrate that it is easier to introduce the tube by sense of touch similar to the manner of O'Dwyer. This will lead to disappointment, failure and the discontinuance of the method.

The question, therefore, of the safety of an indwelling tracheal tube with a lumen sufficient to meet respiratory needs may be considered as satisfactorily solved. The size of tube for a man is 38 F; that for a woman is between 32 F. and 34 F. My own experience with a tube of this external diameter and lumen as a pharyngeal airway in dental cases, substantiates Dr. Jackson's statements as to the adequacy of ventilation.

I therefore propose and can prove the safety and efficiency of a simple intratracheal method for anesthesia. The disadvantages of the method are: the necessity of intubation by direct vision and the presence of the intratracheal tube in the mouth.

The following advantages may be enumerated: (*a*) the elimination of complicated motor-driven apparatus, manometers and devices for warming and heating the vapor; an operating field free from escaping insufflated vapor; an operative field free from anesthetic; normal respiratory rhythm and amplitude; conservation of carbon dioxide; exclusion of foreign matter such as, blood and vomitus, and ability to maintain the lightest anesthesia.

(*b*) Complete control of artificial respiration by the simplest methods.

(*c*) A technic which makes available the maintenance of anesthesia by ether, gas and oxygen, ethylene or any combination of these agents.

(*d*) Protection from external pressure on the trachea.

(*e*) A method for operations on the nose and throat which gives a field resembling that offered with the use of chloroform, with the safety of a light ether anesthesia, and protection against the aspiration of blood.

(*f*) A field of practical asepsis for plastic operations on the face.

SUMMARY

The negative pressure cabinet designed to prevent the collapse of the lung in thoracotomy by decreasing external pressure on the surface

of the exposed lung was superseded by the intratracheal insufflation method of Meltzer and Auer, which provides positive intrapulmonary pressure.

While intratracheal insufflation was introduced as a specific method for operation on the open chest, it was soon perfected by Elsberg, Janeway and others for general use in all operations about the head and neck.

Karl Connell found that intrapharyngeal insufflation sufficed in the great majority of cases in which intratracheal insufflation was employed. Intrapharyngeal insufflation did not require intubation, and the necessary apparatus was simplified.

Although highly satisfactory as a method of general anesthesia for operations on the head and neck, insufflation implies the use of complicated electrical apparatus, and disturbs the field of operation by the ever present large volume of ether vapor.

There appears to be but one positive indication for insufflation anesthesia, and that is in double thoracotomy.

There is, on the other hand, a definite and a real need for a simple intratracheal method.

An extension of the customary simple inhalation methods into the tracheal field is greatly to be desired.

The possibility of such a simple intratracheal method depends on two factors: first, a tube large enough to permit of free respiration through its lumen; and second, the absence of irritation and postoperative complications by the presence of this tube.

Both questions submitted to Dr. Chevalier Jackson for experimentation and judgment have been settled in the affirmative.

It is therefore practical and safe to employ intratracheal inhalation to maintain general anesthesia for surgical operations on the head, neck and elsewhere.

The advantages of the method far outweigh the difficulty of intubation and the presence of the inhalation tube. The difficulty of intubation disappears with practice, and experiments now in progress promise a satisfactory means of practically disposing of the inhalation tube.

COMMENT

A safe, improved and simplified intratracheal method for general anesthesia is offered which may be generally employed for all operations about the head and neck. The method provides a dry, quiet, odorless field of operation, with increased safety to the patient, both from an anesthetic and from a surgical point of view.

1819 Broadway.

PATHOLOGIC CONDITIONS OF THE EAR, NOSE AND THROAT IN DIABETES

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AND

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As focal infection has assumed such a prominent rôle in the field of medicine, and as the ear, nose and throat are so frequently the site of the offending infection, their importance as etiologic factors in diabetes cannot be overrated, especially since they influence the general condition of the patient. It has frequently been observed that the response of a diabetic patient to a dietetic or insulin regimen is never as good in the presence of infection. The tendency toward acidosis is especially pronounced, and it is a matter of everyday observation during the pre-insulin period that acidosis progressing to death not infrequently occurs during the lighting up of an acute process. Woodyatt, Allen, von Noorden and Wilder have stressed the importance of focal infection residing in the teeth, tonsils and paranasal sinuses. Their collective opinion, based on their large clinical experience, is that these infections have a decided influence on the disease, and that even partial eradication of these foci will promptly show better and more lasting results.

The staff of one of the large sanitariums in the middle west insists on the thorough removal of all foci of infection when there is the slightest evidence of their existence in the structures mentioned. We are awaiting their report with interest, especially since it affects the incidental mortality and morbidity consequent to otorhinolaryngologic operations. In the past, operative procedures on diabetic patients were performed with fear and trepidation, owing to the ever present specter of acidotic coma and poor union of the wound. This, however, has now been changed, thanks to the dicoveries of Banting and his co-workers. The diabetic patient is immediately placed under the supervision of an internist, who directs the preoperative and postoperative care and supervises the administration of insulin, which has engendered such radical changes in the operative approach to a diabetic patient.

A little over a year ago, Hempstead and Adams published a comprehensive report from the Mayo Clinic regarding conditions of the ear, nose and throat complicating diabetes. Briefly, they reviewed 416 diabetic cases observed during a period of thirty-one years. Of this number, 141 of the patients had complications of the ear, nose or throat, and in sixty-two cases operative intervention was necessary.

Of the many isolated articles dealing with the relationship of otorhinolaryngologic diseases to diabetes, few are of great value, especially from a therapeutic point of view, as for the most part they concern the preinsulin period. Recently, however, Galloway of Chicago and Seydell of Wichita have contributed two valuable papers which deal with the subject of mastoiditis in diabetes. Galloway stresses the value of insulin and its influence on the course of a mastoiditis complicating diabetes. Seydell reports on the condition of the facial nerve in diabetic mastoiditis. One of us (J. C. B.), during the discussion of Seydell's paper at Montreal, took exception to the statement that a facial paralysis and labyrinthitis was due to diabetes, because the patient recovered without surgical intervention.

During a period of twenty-five years, we have observed a series of seventy-four cases associated with diabetes in the proportion shown in the table.

Various Diseases Associated with Diabetes

Disease	Cases
Furunculosis of nose and ear	4
Deviated septum and hypertrophic turbinates	12
Suppurative rhinosinusitis	6
Chronic tonsillitis:	
(a) with fetor exoris	12
(b) without fetor exoris	19
Chronic indurative laryngitis with attacks of edema	3
Acute otitis media and mastoiditis	9
Chronic otitis media	5
Labyrinthitis and intracranial complication	4
Total	74

Sixty-four of the patients mentioned in the table were observed prior to the use of insulin and ten afterward. Of the sixty-four cases in the first period, operative intervention was instituted in eleven: nine of acute mastoiditis, one of frontal lobe abscess consequent to a chronic frontal sinusitis and one of peritonsillar abscess. No deaths occurred in this series, and local anesthesia was used as much as possible. Postoperative acidosis occurred in most cases but was mild, responding to a dietetic regimen. Operative intervention was instituted in four of the ten cases observed during the insulin period. Here we had the advantages of cooperation from the internist who had complete control of the general management of the patient. We urge the necessity for cooperation with an internist qualified in this field; he should have entire charge of the diagnosis and treatment for the diabetic condition, and should assume the responsibility of indicating and assuring the otolaryngologist of the safety of operating. With this procedure, we are enabled to operate not only in patients usually classed as surgical emergencies, but also in those of a more elective nature.

The preoperative dietetic and insulin regimen, by which the patient is rendered sugar-free, has permitted us to observe a tranquil postoperative course free from such complications as suppuration of the wound, delayed healing and acidotic coma. We have been impressed by a comparison of the postoperative course observed during both periods. In the former, two of the eleven patients operated on showed an acidosis which was alarming; the other nine showed a milder type. Suppuration of the wound and delayed healing occurred in seven instances. A stormy postanesthetic period was noted in five. Acidosis did not occur in patients operated on during the latter period. A tranquil postoperative state, with the usual healing of the tissues, was noted in all. As surgical intervention is no longer restricted to urgent cases, elective operation may be practiced on the diabetic patient. He may now seek relief from a nasal obstruction or discharge due to sinus disease.

A more important phase bears on the relation of chronic infection to the response of a diabetic patient to therapy. It has been noted that the response of such patients to dietetic and insulin regimen is markedly increased by eradicating these foci of infection. In the past, elective surgical intervention was rarely performed, and many diabetic patients, especially those who had milder types of the disease and whose condition could so readily have been improved by attention to these foci, could not enjoy the benefits that are available to diabetic patient at the present time.

Patients who have an acute condition and cannot be operated on show a remarkable difference in their response with and without insulin therapy. In the past, physicians have observed the acute process in the form of a sinusitis or otitis media with its period of activity prolonged as much as four times that of the ordinary case not associated with diabetes. Under insulin therapy the course is essentially similar to that observed in a like condition occurring without the presence of an impaired carbohydrate metabolism.

Since the advent of insulin we have materially changed our conception of what constitutes good surgical judgment in patients with acute processes complicated by acidosis or coma. Confronted with a case of fulminating mastoiditis or acute suppuration in the maxillary sinus associated with marked acidosis or even with coma, we immediately administer insulin buffered by dextrose solution, under the direct supervision of our internist, so as to reduce the acidosis and to bring the patient out of coma. Then, under local anesthesia, a quick opening is made into the site of retention, the more radical measures being postponed until later.

CONCLUSIONS

1. Conditions of the ear, nose and throat complicating diabetes are not infrequently observed.

2. The elimination of chronic foci of infection, which are overloading an already crippled pancrease, may greatly improve the response of a diabetic patient to therapy.

3. Operative intervention, since the use of insulin, can be instituted without fear of precipitating a diabetic coma or a prolonged complicated convalescence.

4. Elective surgical intervention can now be safely practiced on the diabetic patient if the indication is sufficient.

5. Operative procedures in an acute condition should be preceded by a dietetic and insulin regimen under control of an internist, who should shoulder the responsibility for indicating the procedure and for its safety. The surgical procedure should be limited to the minimum, the more radical measures being postponed until later. A local anesthetic should be used; but if general anesthesia is absolutely necessary, ethylene or nitrous oxide may be given.

THE NATURE OF PROGRESSIVE DEAFNESS

FURTHER STUDIES *

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To present a purely scientific paper dealing with the subject of deafness is impossible. Too much remains unknown at present concerning the etiology, pathology and therapy for any one to attempt to be dogmatic. Certain facts, however, are definitely established, and with these as a basis, one can theorize as to probabilities. I will summarize the more important known factors of deafness and set forth probabilities with the hope that they will be investigated and either verified or disproved. At present, I am engaged in an intensive investigation of the subject of progressive deafness, and this paper is a preliminary communication.

At the outset, I will make clear just what my object is in the work I am carrying on. I believe that:

1. Progressive deafness is not a distinct entity.
2. In most instances progressive deafness is a local manifestation of a general metabolic disorder.
3. The present classification of deafness is a hindrance to investigation and research in that it offers both a hypothesis and a conclusion.

The term *progressive deafness,* as used in this paper, signifies any deafness that is progressively getting worse; consequently, it embraces all types of deafness as they are ordinarily classified.

Ordinarily, cases of deafness are divided into two groups, the distinction being made by the use of the various tests for hearing. The response to these tests determines the part of the tone scale in which most of the hearing is lost. According to this determination, one group is designated as being affected in the lower scale and another in the high scale. The former is said to be due to an interference with the conduction apparatus and deafness of this type is called *conduction deafness.* The other is considered as resulting from an impairment of the receptive organ or its central connections and is therefore termed *perceptive deafness.* Most investigators and clinicians have discarded the terms *catarrhal* and *nerve* deafness as being unscientific, nondescriptive and misleading. I believe that the entire nomenclature of deafness requires revision, since it is based on results obtained by a technic of testing the hearing which at best is only an approximation. I certainly cannot agree with, or attempt to utilize for the purposes of research, a classification which, besides giving a hypothesis to begin with, presents a conclusion regardless of the results of investigation.

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For the pursuit of this work, however, some hypothesis was needed. I sought one which did not describe the etiology, give the pathology or outline the course of the deafness. The one I have adopted is based on audiometer readings. The unit loss is translated into percentage loss and the curve obtained places the case in a certain group. I have found that there are four basic types of curves: (1) the straight line, (2) the diagonal down in the low tones, (3) the diagonal down in the high tones and (4) the curve down on both ends. I have checked this classification against the established one, and find that the respective clinical diagnoses (conduction, perception, otosclerosis) do not generally correspond with any one of these curves. Therefore this means of grouping cases of deafness, wherein etiologic factors and clinical diagnosis do not form the basis of the classification, permits conclusions to be drawn from the observations obtained by investigation. Furthermore, for the purpose of studying progressive deafness, all cases are also divided into *acute* or *chronic,* and the latter into *progressive* or *nonprogressive.* The last classification is, of course, based on patients' statements. This broad classification gives an unbiased point of view in every case and permits one to investigate its etiology. I have particularly omitted mentioning the disease commonly referred to as *otosclerosis.* This is the one generally meant when one speaks of progressive deafness. I believe that the subsequent report will substantiate my opinion that otosclerosis as an entity does not exist.

All of my patients are examined as follows: A complete history is taken, rhinoscopic and otolaryngologic examinations are made, hearing is tested with the tuning forks and audiometer, a chemical and serologic study of the blood is made, and the patient is sent to an internist for a thorough examination. The following is a preliminary report based on sixty-three patients examined in this manner.

At present a definite statement can be made only in regard to the cases in which the audiometer curve drops at both ends. The outstanding features of this group were as follows:

1. Eighty-eight per cent of the patients said that their deafness was progressive.
2. Sixty per cent gave a definite history of deafness in other blood relatives.
3. One hundred per cent had increased bone conduction.
4. One hundred per cent showed a raised lower tone limit.
5. Forty per cent of the patients were examined by an internist, and all showed a chronic metabolic disease elsewhere in the body.
6. One hundred per cent showed a disturbed calcium metabolism; 84 per cent had a decreased blood calcium, while 16 per cent had an increased blood calcium.
7. Seventy-six per cent showed an increase in the blood uric acid.

This group, then, consists of patients who had progressive deafness, an increased bone conduction and a raised lower tone limit, and who showed a derangement of their blood calcium. In addition, the greatest percentage of patients had an increased blood uric acid and gave a history of hereditary deafness, and all who were examined showed a chronic metabolic disease elsewhere in the body.

In none of the other three groups are there nearly as definite symptoms as in the group which presents the drop in the audiometer curve at both ends. In all of the groups, however cases were encountered that were identical in every respect with the cases in the definite group described; the only difference was in the type of audiometer curve obtained. In these cases, the blood chemistry was deranged, the bone conduction was increased and the lower tones were lost. The deafness was progressive and, according to the patients' history, hereditary. In addition, there were some cases in the remaining three groups which showed some of the factors just described while they lacked in the others.

On analysis of these groups, only the following fact stands out prominently. *Progressive deafness does not necessarily give a definite type of hearing curve.* Therefore it is impossible to recognize or diagnose a progressive deafness from the hearing tests alone.

If the four basic curves which can be obtained are scrutinized, it will be seen that the straight and the two diagonal curves can be changed into the curve that drops at both ends. For instance, the diagonal down in the low tones can become changed by a further loss in the high tones, into the curve down at both ends. Similarly, the diagonal down in the high tones can assume the curve down at both ends if the lower tone scale is further affected. It is conceivable, then, that the straight and the two diagonal curves may be the early or the intermediate curves of a progressive deafness which will eventually assume characteristics of the curve that drops at both ends, the latter seeming to be the end-result of a progressive deafness.

Since it appears that in the formative or early stages of a progressive deafness any type of hearing response may be elicited not only as shown by the percentage curve of the audiometer reading but by the tuning forks as well, a progressive deafness cannot be characterized or identified by the hearing tests at this stage. It is only when the late stages have been reached that a characteristic response is elicited. The investigation of chronic progressive deafness, however, has for its ultimate purpose the cure of the condition, or, if this is impossible, the arrest of the deafness in its progress. It is evident, therefore, that if anything is to be accomplished in these cases, it can be done only during the early or intermediate stages; consequently, other factors must be sought which will be diagnostic early in the course of the deafness.

The etiologic factors responsible for progressive deafness are vague at present. Nevertheless, my study of cases showed that certain symptoms in this respect are so prominent and so constant that they must be considered in detail.

In 60 per cent of the definite group of cases of progressive deafness wherein the audiometer curve was down at both ends, there was a history of other members of the family being hard of hearing. In only a few instances was I able to examine any of the other relatives who were deaf and ascertain the type of hearing response. But, since all the patients who gave a history of hereditary deafness showed progressive deafness, regardless of the type of audiometer curve obtained, it is reasonable to assume that heredity plays either a direct or an indirect etiologic rôle. More than this I cannot say, because I look on this factor as incidental in the light of the more constant characteristics present in all cases of progressive deafness, regardless of whether the defect is hereditary or not.

Forty per cent of the patients who showed a curve that drops at both ends were examined by an internist, and all showed the presence of a chronic metabolic disease elsewhere in the body. In addition, all showed a deranged calcium metabolism, and in most of them there was an increase of uric acid in the blood. These pathologic characteristics were definite and constant in every case of chronic progressive deafness showing this type of audiometer curve together with increased bone conduction and a raising of the lower tone limit. They indicate the presence of a metabolic disorder. That this disorder is not a distinct disease in every case, is admitted. In some cases, chronic nephritis was found; in others, diabetes (20 per cent), menstrual disorders, gouty diathesis and vasomotor disturbances. In any event, the finding of some metabolic disturbance is constant.

Among the cases in which the other types of audiometer curve were shown, it was noted that those patients who showed a deranged calcium metabolism had similar metabolic disorders. In other words, the finding of a metabolic disturbance was not limited to the cases of deafness in which the audiometer curve dropped at both ends. It is also to be noted that when metabolic disorder was found in conjunction with deranged calcium metabolism, deafness was progressive. Therefore, in some manner, there exists a relationship between progressive deafness and a disturbance in metabolism.

Is the metabolic disease the cause of the progressive deafness or is it an incidental occurrence? There are certain known factors concerning the relationship of metabolic diseases to deafness. It is known that Paget's disease is associated with progressive deafness. It is also known that certain deficiency diseases, such as rickets, are associated with pathologic changes in the acoustic mechanism, which must interfere with

the transmission and perception of sound.[1] In pregnancy and in ovarian dysfunctions progressive deafness is frequent.[2] This also is true in diabetes, gout and rheumatic diathesis.[3] In these instances the metabolic disturbances are due to definite diseases. On the other hand, there are many other disturbances of metabolism which are as yet not definitely understood and to which no name can be given. The intestinal disturbances comprise perhaps the greatest precentage of this unknown group. Here also I have encountered cases of progressive deafness wherein the only cause for the disturbed metabolism was the obstinate constipation present. In metabolic disorders, such as vasomotor rhinitis, wherein Dr. M. J. Gottlieb has found derangements in the blood chemistry similar to those found in my cases of progressive deafness, such deafness is often encountered.[4] I have had four such cases of progressive deafness associated with vasomotor rhinitis, and Dr. Gottlieb has told of two which he has had. In an article soon to be published, Dr. Gottlieb remarks on the possibility of a common etiology for the vasomotor rhinitis and the progressive deafness, and limits it to a toxic absorption from the intestinal tract.

All these facts impress me with the thought that the metabolic disorder is the active cause of the progressive deafness. As a disturbed metabolism is demonstrated best by a study of the chemistry of the blood, I believe that in this study lies the early diagnosis of a progressive deafness.

In analyzing the results of chemical examination of the blood, I find one constant factor, a derangement in the calcium content. In a previous article [5] I reported the occurrence of a derangement of the blood calcium as a diagnostic aid in otosclerosis, not having formed any conclusion as to its significance. That paper was merely a preliminary report of this one factor in cases of undifferentiated deafness. My further studies have as yet thrown no light on the significance of this fact. I still consider derangement in blood calcium as diagnostic of a progressive deafness, and the comments in my previous paper apply also to the type of progressive deafness in which the audiometer curve drops at both ends. I had, however, already begun to realize that not every case of progressive deafness gives the same clinical results when the hearing is tested. I believe that the derangement in the calcium content is the result of a

1. Ferreri, G.: Arch. Internat de laryngol. otol. rhinol. vol. 30, 1910; vol. 33, 1912. Kaufman, Creekmur, and Schultz: Changes in the Temporal Bone in Experimental Rickets and Their Relation to Otosclerosis, J. A. M. A. **80**:681 (March 10) 1923.

2. Stein, C.: Wien. klin. Wchnschr. **38**:136, 1925.

3. Bryant, S.: Monat. f. Heilk. vol. 47, 1913.

4. Gottlieb, M. J.: Personal communication, Vasomotor Rhinitis.

5. Kopetzky, S. J., and Almour, R.: Arch. Otolaryn. **1**:473 (May) 1925.

metabolic disturbance. It certainly is not the cause of the progressive deafness, as so many have misunderstood me to imply. What its exact cause is, I am not prepared to state. I believe that there may be some alteration in the secretion of the parathyroid glands. Bloehmke [6] and Orzechowski [7] also have this view. Whether the parathyroid exerts its action directly on the ear or on the intestinal proteolytic activity, thus increasing the absorption of toxic products,[8] is not clear. In any event, I believe that the finding of a derangement in the calcium content of the blood is significant of a chronic progressive deafness, regardless of the type of hearing curve, and should lead to further investigation of the metabolism of the person presenting such deafness.

In connection with the finding of the calcium disturbance in the blood, it is noted that some cases show an increase in calcium and others, a decrease. The explanation for this is far from clear. However, in view of the observation of Dr. Hadjopoulos, who is collaborating in this work, that rats fed on a calcium-free diet show an increase in calcium content in the blood during the period of the development of rickets, it seems possible that the finding of an increase in calcium may indicate the activity of the lesion producing the deafness. Conversely, a decrease in calcium may denote a cessation of the activity of the lesion which is the cause of the deafness.

The results of a chemical examination of the blood in the group of cases showing the curve down at both ends indicate that the greatest percentage show an increase in uric acid. The observation of Horowitz [9] in this connection is of importance. He finds that in most of the cases in which he obtained a high uric acid figure a disturbance of hearing was present. I have examined several patients for him and have found that all of them have the progressive type of deafness. In addition, the blood calcium in these cases has been low.

Much has been written on the similarity of bone diseases (such as osteomalacia, rickets, osteitis fibrosa of von Recklinghausen, Paget's disease) to progressive deafness.[10] In addition, Beck,[11] on making roentgen-ray examinations, noted changes in the long bones of patients who had otosclerosis. With the idea of determining what changes, if any, occurred in the bony skeleton in my cases of progressive deafness, I have had roentgenograms made in six of my cases; four were cases of progressive deafness and two of nonprogressive deafness. In the four

6. Bloehmke, A.: Arch. f. Ohren. **102**:1, 1918.
7. Orzechowski, K.: Wien. klin. Wchnschr. **34**:1078, 1917.
8. Dragstedt, R. S.: Am. J. Physiol. **63**:408 (Feb.) 1923.
9. Horowitz, P.: Am. J. M. Sc. **171**:560 (April) 1926. Also personal communication.
10. Siebenmann, F.: Verhand. d. Otol. Gesellsch. Keil, 1914, p. 219. Mayer, O.: Wien. med. Wchnschr. **63**:229, 1912.
11. Beck, J. C.: Trans. Amer. Laryn. Rhin., and Otol. Soc. 1915.

cases there were definite changes in the long bones. The following are the observations of Dr. Henry K. Taylor, who is conducting this part of the work.

CASE 1.—Paget's disease.

CASE 2.—Thickening of cranial vault; cystic area in occipital bone, sacroiliac arthritis; periosteal proliferation of fibula. He believes this to be significant of an early Paget's disease.

CASE 3.—Periosteal elevation on the outer side of ulna.

CASE 4.—Periosteal proliferation along the inner aspect of the fibula.

These are the roentgen-ray observations in the four cases of progressive deafness. In two cases that were nonprogressive there were no changes in the bones. This part of the work is being continued, and more data will be obtained. I am reporting my observations, but I cannot attach any value to them because they are based on too few cases.

SUMMARY

This is a preliminary communication on my investigation of progressive deafness. I feel that chronic progressive deafness is a local manifestation of a general metabolic disorder. I am confident that it rarely, if ever, exists as an isolated entity.

Judging by further observations on the calcium content of the blood in cases of deafness, I am now certain of the value of the derangement of this element in establishing a diagnosis of chronic progressive deafness.

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SALIVARY CALCULUS OF THE SUBMAXILLARY GLAND*

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The presence of calculi in the salivary glands or their ducts is apparently of rather infrequent occurrence, if one considers only the reported cases. Proetz,[1] writing on the subject in 1923, states that about 300 cases had been reported up to that time; while Harrison,[2] writing on the same subject in 1926, found 375 cases in a review of the literature from 1825 to the date of his writing. To these he adds twenty-seven cases of his own. Undoubtedly there are many cases which have not been reported.

Calculi may form in all of the salivary glands or their ducts, but the larger proportion, about 60 per cent, are found in the submaxillary gland. The parotid and sublingual glands each furnish about 20 per cent.

As to origin, Brophy[3] states: "There seems to be no question that calculus formation in the salivary apparatus, as elsewhere, is caused primarily by infection. Salivary calculi are composed essentially of phosphate and carbonate of calcium."

It is difficult to approximate the time necessary for a given calculus to reach the size attained at the time of its recognition, but it is probable that many have been forming for several years without producing any distressing symptoms. Should acute infection occur at the site of the calculus, the picture changes and the person may suddenly become painfully conscious of local disturbance, as the history of the following case will show.

REPORT OF A CASE

History.—A white woman, aged 36, came to the clinic at Jefferson Hospital complaining of severe pain in the floor of the right side of the mouth, particularly in the portion opposite the molar teeth and extending into the side of the tongue. Pain and swelling were also marked in the tissues of the neck immediately below the angle of the jaw. Within the mouth there was swelling between the right side of the tongue and the alveolar process. During mastication, the swelling in the floor of the mouth increased. The stoma of Wharton's duct on this side was red and swollen. This condition had been present for several days and had been growing worse in spite of various applications made by the patient before coming to the hospital. By pressing with the finger along the course of Wharton's duct

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* Read before the Section on Otology and Laryngology of the College of Physicians of Philadelphia, Jan. 19, 1927.

1. Proetz, A. W.: Two Cases of Salivary Calculus, Ann. Otol. Rhin. & Laryng. **32**:233 (March) 1923.

2. Harrison, G. R.: Calculi of the Salivary Glands and Ducts, Surg. Gynec. Obst. **40**:431 (Oct.) 1926.

3. Brophy, T. W.: Oral Surgery, P. Blakiston's Son & Co., 1917, p. 970.

from behind forward, it was possible to express a quantity of yellowish gray, semifluid matter, which evidently consisted of saliva mixed with pus. A stained smear of the material showed the presence of a large number of pus cells and mixed bacteria. When the patient was first seen it was impossible, because of the swelling and pain, to determine whether a foreign body might be the seat of an infection having drainage by way of Wharton's duct. Therefore treatment was directed toward the removal of the acute symptoms. After a few days the swelling, especially in the mouth, had subsided considerably. It now became possible, by palpation over the floor of the mouth at the same time that counter pressure was exerted on the outside below the mandible, to detect the presence of a distinctly hard object immovably fixed within the tissue almost opposite the last molar tooth. This was suspected to be a calculus. It was possible to introduce a filiform bougie through Wharton's duct for a distance of about 2 inches (5 cm.), which seemed to indicate that the foreign body lay beyond the

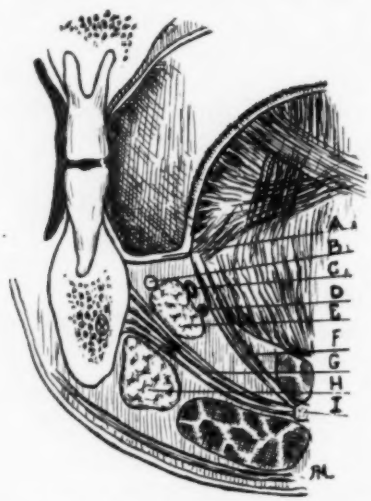

Fig. 1.—Frontal section made in the plane of the last molar tooth. The tongue is shown forcibly retracted to the left thus producing a triangular area with its apex at the hyoid bone, and having for its outer side the mylohyoideus muscle, the hyoglossus muscle for its inner side, and the base formed by the mucous membrane of the floor of the mouth. Within this area, the relations of the deep portion of the submaxillary gland, Wharton's duct, and the lingual and hypoglossal nerves are shown. *A* indicates the paralingual mucosa; *B*, the lingual nerve; *C*, Wharton's duct; *D*, the hypoglossal nerve; *E*, the deep submaxillary gland; *F*, the hyoglossus muscle; *G*, the mylohyoideus muscle; *H*, the superficial submaxillary gland and *I*, the os hyoideus.

duct itself. In addition to this evidence, a roentgen-ray study showed a distinct shadow in the affected region. A calculus situated within the submaxillary gland and near the beginning of Wharton's duct was diagnosed. Treatment was continued in an attempt to reduce further the acuteness of the infection, but after three weeks a moderate degree of swelling below the angle of the jaw was still evident, and purulent material could be expressed from Wharton's duct. There did not appear to be any other course open than the removal of the calculus, which apparently was the seat of infection and which caused the continuation of an acute inflammation.

Operation.—A 1 per cent solution of procaine hydrochloride was injected superficially and deeply into the tissues surrounding the calculus. Then, with the tongue retracted over to the left side, a small incision was made through the mucous membrane directly over the calculus. This was then exposed with as little actual cutting of tissue as possible, because of the danger of injury to important nerves and to the duct itself. When sufficiently exposed, the roughened stone was disengaged from the surrounding tissue and removed. The edges of the wound were brought together and held with a single suture which did not entirely close the wound, thus providing for drainage during the process of healing. Wharton's duct was kept patulous by the passage of a filiform bougie two or three times weekly. After about six weeks of postoperative treatment, all drainage had ceased, the wound had healed, and practically all of the swelling of the submaxillary gland had disappeared. The salivary secretion coming from the duct appeared to be normal in color and consistency.

COMMENT

The conditions in this region most likely to cause confusion when one is making a diagnosis are those of dental origin. In all such cases, the roentgen-ray examination is especially helpful, since it would almost certainly show the presence of abscess about the teeth. According to Harrison, the roentgen ray is of definite value in showing the presence of calculi in from 75 per cent to 80 per cent of such cases, although in some instances only after repeated examinations. In the case herein reported, the teeth were not under suspicion, as they were in excellent condition. A calculus in the duct or gland was suspected because of the appearance of pus mixed with saliva from the duct. Palpation, together with positive roentgen-ray observations, definitely determined its presence and location.

The diagnosis may be easy or difficult in any given instance, but operative removal of the calculus presents certain dangers inherent in every case. Reference is made to the proximity of the lingual and hypoglossal nerve and Wharton's duct, none of which should be severed during the operation, since this would result in marked functional disturbance. A general idea of the anatomic relations involved in the region occupied by the deep portion of the submaxillary gland and the beginning of Wharton's duct may be had by visualizing the cut surface of a frontal section made on a plane corresponding to the position of the last molar tooth, with the tongue forcibly retracted toward the opposite side of the mouth. One can definitely outline a triangular area having for its apex the hyoid bone. The mylohyoid muscle extends upward and outward from the hyoid bone to the mandible, and forms the outer side of the triangle. The opposite, or inner side, is formed by the hyoglossus muscle, while the base of the triangle is formed by the mucous membrane covering the floor of the mouth. The central portion of this area is occupied by the gland substance with the duct. Above the duct may be seen the lingual nerve, while the hypoglossal nerve is found below. The general direction of these nerves and the duct is from behind forward,

but both nerves cross the duct at some point in its course, in order to reach the side of the tongue to which they are distributed. By skilful dissection, these nerves and the duct may be spared unnecessary injury. Carter [4] advises the prompt removal of all calculi, particularly when found within the gland, not only because of the discomfort caused by their presence, but also because of the liability to abscess formation.

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4. Carter, W. W.: Salivary Calculus: Report of a Case, Laryngoscope **27**:881 (Dec.) 1917.

INFLUENCE OF FILTERED QUARTZ LIGHT ON THE NASAL GANGLION

PRELIMINARY REPORT *

HARRY MEYERSBURG, M.D.
BROOKLYN

Symptoms referable to the nasal ganglion are varied and depend on pathologic changes which are little understood. They are manifestations of a morbid state either in the sphenopalatine ganglion itself or in some part of the sympathetic system, the ramifications of which enter the substance of the ganglion or form a network around it.

Many of the ancient textbooks and monographs refer to the neurotic origin of excessive sneezing—rhinorrhea, lacrimation and other symptoms observed in rose-cold, hay-fever and allied conditions; but it remained for Sluder [1] to work out the problems associated with sphenopalatine disease. His description of the anatomy of the nasal ganglion and the bony recess in which it is located, established clearly why the so-called neuralgic syndrome may be the result of extension of inflammation from the paranasal sinuses.

The effectiveness of any therapeutic surface agent applied to the region of Meckel's ganglion will depend on two factors: first, the constancy of the anatomic arrangement of the ganglion and that of the sphenomaxillary recess; second, the depth of penetration of the agent thus applied. The ganglion may lie in close relation to the nasal mucous membrane, or it may be from 8 to 9 mm. external to it.

When one stops to consider how little the rays of quartz light actually penerate, then one can begin to appreciate that failures must occur in some cases. The interposition of a fat layer will, in my estimation, materially reduce the effectiveness of ultraviolet light. Since this work was begun there have been but two outstanding failures in a group of patients with rose-cold and hay-fever, and these were in obese persons.

As a matter of convenience, cases of nasal ganglion neuritis may be classified in three general groups: (1) painful or sensory, (2) painless or secretory and (3) a combination of the first and second groups. In the first group are to be found those referred to by Sluder as cases of painful syndrome.[2] In the second group have been included all cases

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* From the Department of Otolaryngology, Long Island College Hospital.

* Read before the Section on Otolaryngology, Kings County Medical Society, Jan. 11, 1927.

1. Sluder, Greenfield: Headaches and Eye Disorders of Nasal Origin, St. Louis, The C. V. Mosby Co., p. 69.

2. Sluder, Greenfield: Headaches and Eye Disorders of Nasal Origin, p. 70.

of rose-cold, hay-fever and idiopathic rhinorrhea. This is the group referred to by Sluder under the heading of sympathetic syndrome. A few patients under my observation complained of secretory disturbance followed or accompanied by pain, pupillary changes and other symptoms. These have been placed in a distinct group. In addition to these types, a few cases of asthma following hay-fever also have been seen which were influenced favorably by exposure to filtered quartz light.

In some of the cases reported herewith, itching and lacrimation alone were reduced at first; in others sneezing disappeared before the subsidence of the eye symptoms.

In the treatment of all patients up to the present, the application of epinephrine hydrochloride was purposely avoided to eliminate the possible contribution of any added benefit from this preparation. While many of the patients had received general and special treatment prior to application of the ultraviolet light, all such treatments and injections were discontinued at the beginning of the quartz light treatments.

There is nothing new about the nasal application of ultraviolet light in cases of rhinorrhea and hay-fever.

During my visit to A. J. Cemach's clinic in Vienna in the summer of 1923, twenty-seven patients were treated by this method, and twenty-two, or 81 per cent, were materially benefited. His technic consisted of the introduction of a narrow, round quartz rod, smooth at its distal end. This was screened by a uviol glass (blue) filter and the applicator withdrawn fractionally, exposing the whole nasal mucosa on both sides for a period of about twelve minutes (total radiation). The patients were prepared previously with topical application of epinephrine, 1:5,000, and cocaine, 20 per cent. When asked the reason for the striking improvement of the patients following quartz light radiation, Cemach frankly admitted that he did not know at the time.

These observations aroused my curiosity which, up to this time, had been only partly satisfied. The benefit to the patient could not be attributed to a general constitutional change, because the limited action of the ultraviolet light over so small an area could hardly influence the chemistry of the blood stream. The only other probability in my mind was the effect on a nerve ganglion closely associated with sympathetic filaments.

This work was begun in 1924 by exposing only the nasal ganglion region to the filtered light of the Kromayer lamp. The apparatus then in vogue in this country was not designed for accurate intranasal manipulation, but the new self-contained unit is admirably adapted to the work of the rhinologist. The method of filtration of only a few years ago was crude and impracticable. This has since been modified so that today the ultraviolet spectrum can be changed at will without any loss of time or discomfort to the patient.

AUTHOR'S TECHNIC

The patient is required to sit upright during the treatments. No refinement in the way of a special chair with head-rest has been designed. An ordinary straight back chair against the wall with a pillow back of the patient's head has been used.

Color Filtration.—Considerable time and effort has been spent in the perfection of a satisfactory method of color filtration. This was accomplished in the follow-

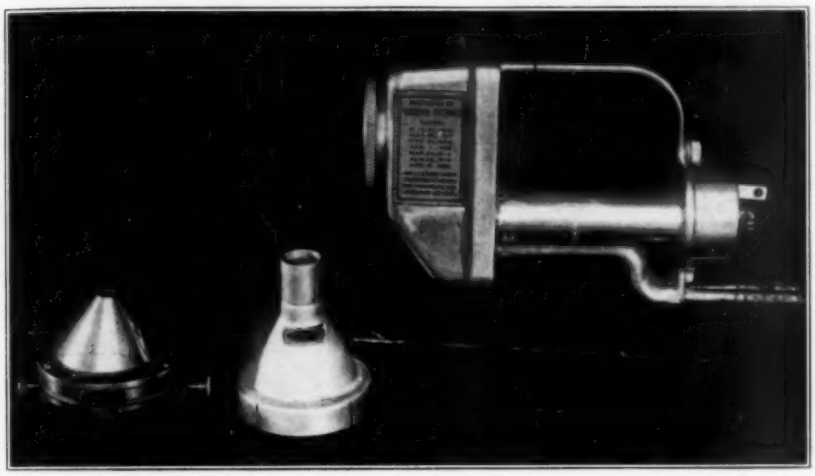

Fig. 1.—The Kromayer lamp and two types of adapters.

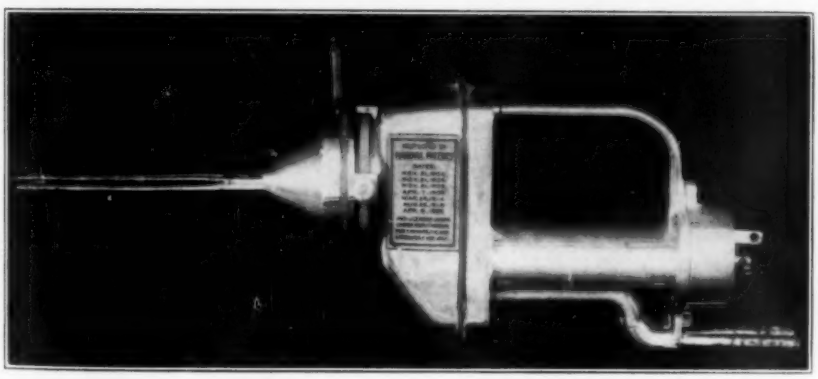

Fig. 2.—Applicator and liquid filter in position for use.

ing manner: The regular adapter was modified by placing a slit in such a position that a uviol glass filter could be interposed between the proximal end of the quartz applicator and the window of the Kromayer lamp. While the spectrum obtained seemed satisfactory as to quality, the intensity (quantity) of the light coming through the applicator was questioned. I then suggested variations in filtration to determine just which part of the ultraviolet spectrum was responsible for the best clinical results. At my insistence, genuine quartz capsule liquid color filters were developed. For practical application five different dilutions of watery solution

of copper sulphate in flat quartz containers and one dilution of cupric amine sulphate are used, all hermetically sealed to prevent deterioration and color change.

Applicators.—Interest was next directed to the development of proper applicators designed to reach the nasal ganglion with the least discomfort to the patients, so many of whom were found to have more or less septal deviation and turbinate hypertrophy. A flat straight applicator was found to be best adapted to all cases. Two sizes can be employed, according to the available space in the nasal chamber. Bent applicators are avoided to prevent dissipation of valuable rays in the postnasal space. In the latest type of applicator the distal end is blown with air bubbles to increase radiation.

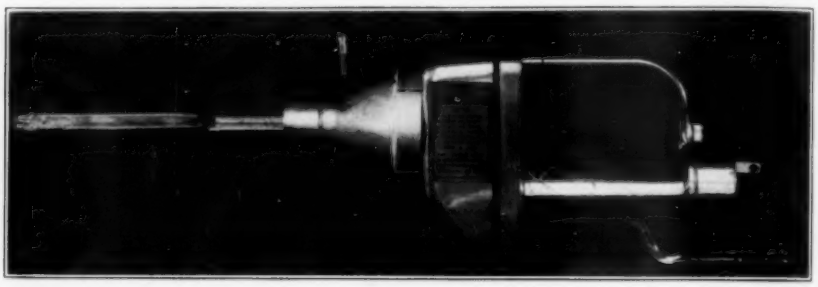

Fig. 3.—Aluminum adapter (new type).

Fig. 4

Fig. 5

Fig. 4.—Uviol glass filter.

Fig. 5.—Liquid quartz capsule.

There is no constant visible change in the nasal mucosa immediately following quartz light application. As some of the benefit obtained is subjective, each patient was requested to keep a sort of diary concerning his or her own case. My records are made up mostly from such notes submitted by the patients, supplemented, of course, by additional data, the result of personal observation.

Examination of the Patient.—Each patient was thoroughly examined and the diagnosis established before treatments were instituted. Special attention was directed to the condition of the sinuses and the teeth. This is particularly important in the painful cases; a patient was not treated until the dental and

sinus conditions were entirely eliminated. A few patients whose cases were classified in the secretory group were treated, despite the presence of polypoid degeneration and sinus disease. Almost complete failure followed quartz light exposure in these patients.

Preparation.—The standard preparation of a 1 per cent solution of cocaine was adopted for the nasal spray and a 5 per cent solution for topical application in the lower meatus only. The quartz applicator was introduced beyond the nasal cavity, not under vision, with the patient sitting upright in a straight back chair, the head against a cushion. The lamp was previously operated for about five minutes to insure proper voltage. It was now brought to the level of the proximal end of the applicator and the applicator engaged in the adapter, in which the desired filter had been introduced. The average exposure on each side was 6½ minutes; the average interval between exposures, four days, and the average number of exposures, four.

The Spectrum.—The spectrum of the mercury vapor arc consists of rays varying from about 1,850 to 8,000 angstrom units (from 185 to 800 millimicrons). Wave lengths shorter than 2,300 angstrom units are irritating and are not of any special therapeutic value; those longer than 4,400 angstrom units are known as

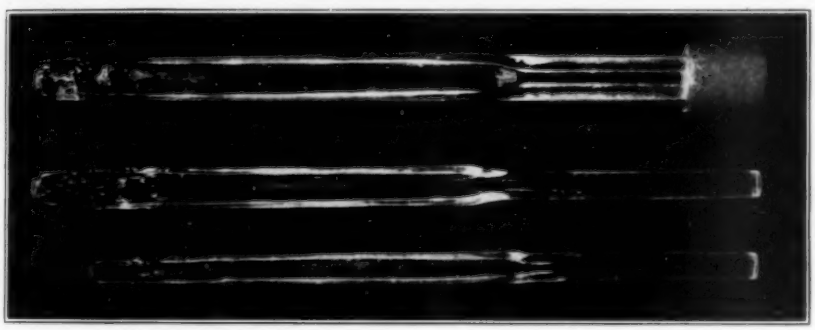

Fig. 6.—Various types of quartz applicators.

the visible rays. These have little value in the work. The object of filtering the light, therefore, is to eliminate both ends of the mercury vapor spectrum. The liquid-filled quartz capsules and uviol glass do this satisfactorily, and the spectograms show exactly which rays are utilized when a certain filter is applied. This makes for accurate dosage in wave lengths and allows free exposure of tissues with the positive assurance that a harmful local reaction can not possibly follow even prolonged exposure.

Filtration is essential in applications to the mucous surface in and behind the nose because of unavoidable compression of the delicate membrane by the applicator. It is a recognized fact that compression of any tissue in the application of white quartz light soon results in the destruction of that tissue. This is taken advantage of in the treatment of certain pathologic lesions where such action is desirable.

One or two cases have been selected from each group previously mentioned in this report.

CASE REPORTS

CASE 1.—A. J., aged 15, high school student, unmarried, seen on Nov. 29, 1926, developed severe pain in the left half of the head and face, extending down to the left shoulder one year before presentation. This was constant at first, but since extraction of the lower left second molar tooth, in the spring of 1926, it had

become intermittent, leaving a residual dull discomfort which was always present. Lacrimination or rhinorrhea did not accompany the pain at any time.

There was an irregular deviation of the nasal septum (nonobstructive). There was no intranasal evidence of sinus disease. Transillumination and stereoscopic roentgenograms of the sinuses and teeth were negative. A previous examination by a rhinologist and internist was negative. The first exposure to the quartz light was made on Nov. 29, 1926, nos. 3 and 6 liquid filters being interposed. The areas of the nasal ganglion on both sides were treated for four minutes. The second treatment was given on December 1, with nos. 2 and 4 filters; total radiation, twelve minutes; the third treatment on December 22, nos. 1 and 3 filters; total radiation, fourteen minutes; the fourth treatment, on December 24, nos. 1 and 3 filters; total radiation, eight minutes.

Discomfort between attacks disappeared after the second exposure, and there has not been any attack following the fourth exposure.

Case 2.—B. M. B., aged 23, unmarried, a physician, had an attack which began during the night of May 18, 1926, with severe neuralgic pain on the right side of face and head, associated with lacrimination from the right eye and sneezing. This attack lasted most of the night and wore off during the morning. A similar attack occurred each night thereafter for a week. In addition there was a morning attack each day at 11 o'clock lasting six hours. There was no relief from pain following the administration of coal tar preparations and morphine.

The patient applied for treatment on May 27. There was unilateral rhinorrhea and lacrimation of the right eye, slight dilatation of the right pupil and characteristic distribution of pain suggestive of nasal ganglion neurosis. There was no evidence of sinus involvement. Transillumination of the frontal and maxillary cells was negative. The teeth seemed to be in good condition. Roentgenograms of the teeth and sinuses were negative.

A topical application of 25 per cent cocaine to the region of the nasal ganglion was followed by some relief for a few hours.

On May 28 the same treatment was applied without relief from pain.

On May 29, filtered quartz light was applied to the nasal ganglion on the right side. A uviol filter was used with a total radiation of six minutes. There was complete relief from pain forty-eight hours after application.

On June 1, 1926, the patient presented himself for examination, not complaining of any symptoms. Despite the fact that he was well, I recommended another exposure to quartz light. The same area was exposed in the same way. Six hours after this application all the symptoms returned, including severe pain, which lasted two days, after which there was complete relief. The relief has continued to the present time.

Case 3.—G. S. H., aged 41, married, a housewife, seen Oct. 5, 1925, had had a profuse continuous watery discharge from the left nares for the past four years. There were no associated symptoms except occasional sneezing. The condition was previously diagnosed as unilateral vasomotor rhinorrhea, cerebrospinal rhinorrhea having been suspected and excluded. The patient used from ten to twenty large handkerchiefs a day.

The results of examination of the ears, nose and throat were entirely negative, except for a profuse watery discharge from the left nostril. Transillumination of the sinuses was negative.

The first quartz light treatment was given on Oct. 5, 1925, following which the patient still used from ten to twenty handkerchiefs daily. The second treatment, October 8, was followed by a severe reaction. The third treatment was given on October 26, after which the discharge dried up completely. A uviol glass filter was used in this case.

Case 4.—B. L., aged 41, married, a housewife, seen Aug. 19, 1926, had been subject to hay-fever each season for the past twenty-two years, beginning the third week in August. The patient had had no symptoms yet that season. She was advised to return if typical symptoms developed.

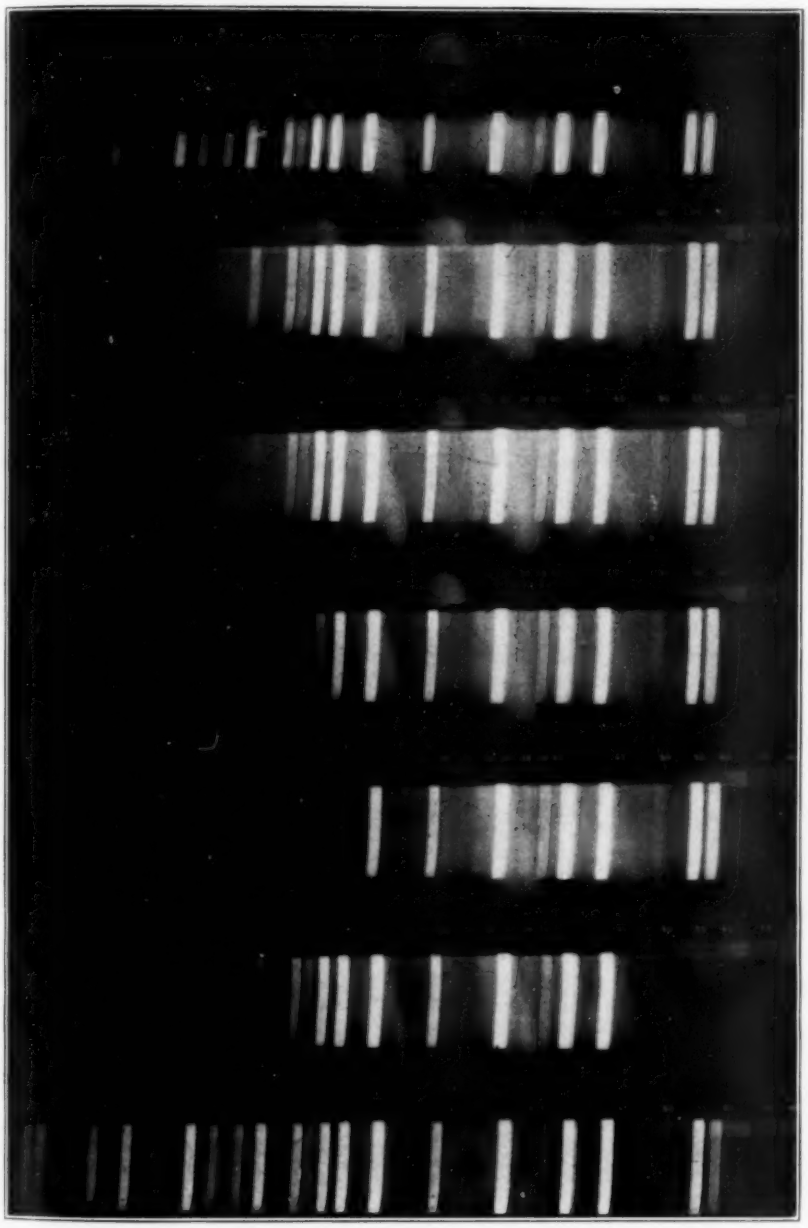

Fig. 7.—Spectrogram of various quartz filters. Reading from the top, down: first row, 5 per cent copper sulphate solution; second, 10 per cent copper sulphate solution; third, 15 per cent copper sulphate solution; fourth, 30 per cent copper sulphate solution; fifth, saturated solution of copper sulphate; sixth, 30 per cent cupric amine sulphate; seventh, Kromayer lamp spectrum.

Examination revealed that the septum deviated to the right side. The nasal mucous membrane, including that over the middle and lower turbinates, was distinctly turgescent and somewhat paler than normal. No intranasal pus streak was visible. Transillumination was negative. The tonsils showed a subsiding acute inflammation. The teeth were in good condition and the ears and the larynx were normal. The results of postnasal examination were negative.

On August 28, the patient returned, complaining of all of the typical symptoms of hay-fever.

The first treatment was given on August 28, with liquid filters, radiation, ten minutes; the second treatment, on August 30, with liquid filters, radiation, twelve minutes; the third treatment, on September 4, with liquid filters, radiation ten minutes, and the fourth treatment, on September 9, with liquid filters, radiation, twelve minutes.

In this case practically all symptoms had disappeared after the second exposure.

CASE 5.—(Referred by Dr. Eckerson, July 13, 1926.) F. S., aged 23, unmarried, no occupation, had had a "rose-cold" for five seasons, which began on May 11, 1926. The patient said that she was sensitive to spring grasses, as well as ragweed. During the past four years she had developed exacerbation during August, the symptoms persisting until the latter part of October. She was subject to frequent colds of the head during the winter months.

There was a spur parallel to and about 2 cm. above the floor level, on the right, which seemed to be obstructive. There was no intranasal evidence of an infection of the sinuses. Transillumination was negative. The teeth were in good condition. The tonsils were flat, submerged and distinctly infected. The diagnosis was rose-cold and hay-fever.

The first treatment was given on July 13, liquid filters being used, and a total radiation of ten minutes; the second treatment, on July 17, with liquid filters, total radiation, twelve minutes; the third treatment, on July 22, with liquid filters, total radiation, twelve minutes, and the fourth treatment, on July 26, with liquid filters, total radiation, twelve minutes.

The symptoms began to subside after the third exposure and disappeared following the fourth. The patient reported that she did not develop symptoms during the ragweed season.

CASE 6.—(Referred by Dr. Richard Bennett.) R. O. B., aged 50, married, a physician, seen May 26, 1926, had had classic symptoms of rose-cold, beginning late in April or early in May, every year, for the past five years. The sixth attack began about the first week in May. He had taken eight weeks of desensatization without apparent relief of symptoms. The injections were begun before the onset of attack.

The septum was irregularly deviated but nonobstructive. The nasal mucous membrane was decidedly turgescent. There was a watery discharge from both nares.

The first treatment was given on May 26, a uviol glass filter being used with a total radiation of ten and one-half minutes; the second treatment, May 29, with uviol glass filter and a total radiation of twelve minutes.

In this case all symptoms subsided within forty-eight hours of the first exposure. The second exposure was followed in six hours by a violent reaction, in which all symptoms (sneezing, itching, rhinorrhea, stuffiness) appeared and persisted, subsiding gradually during the following forty-eight hours. There was no recurrence during the remainder of the season.

CASE 7.—Mrs. M. B., aged 33, married, a housewife, seen Aug. 28, 1926, had had hay-fever for nine seasons, beginning the latter part of August with all the classic symptoms.

The septum was irregularly deviated, sufficiently to render insertion of applicators difficult. The tonsils had been removed. There was no evidence of sinus disease. Transillumination was negative. There was eczema of both external auditory canals. The middle ears were normal.

Treatments were instituted and continued on the following dates: August 28, 30; September 2, 6, 8, 11 and 13, 1926. The average radiation period, fifteen minutes (liquid filters), did not give the slightest relief from any of her symptoms.

The patient was obese, and I believe a layer of fat prevented penetration of the rays.

CONCLUSIONS

1. Filtered mercury vapor quartz light properly applied is followed by relief from symptoms in many cases of secretory and sensory disturbances of the nasal ganglion.

2. The effects thus obtained are not permanent in the seasonal secretory cases.

3. A tolerance to ultraviolet light is developed in the mucous membrane as in the skin. Too many treatments and too long exposures are to be avoided.

4. Straight flat applicators are best adapted to the needs of the rhinologist.

5. Unfiltered light must be employed with care, and only by one acquainted with the physical action of such light on tissues. Here the personal equation is to be considered (weight, complexion, previous exposure, etc.).

6. A few patients with asthma following hay-fever were definitely relieved by filtered quartz light.

7. For routine work, a dilute solution of epinephrine hydrochloride, or a substitute (antipyrin solution) will enhance the effectiveness of quartz light by reducing the local blood supply.

338 Clermont Avenue.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

TONSILS AND ADENOIDS

ARTHUR W. PROETZ, M.D.
ST. LOUIS

The bibliographic material on subjects relating to tonsils and adenoids which has appeared in the past twelvemonth indicates an increasing interest in the more profound and scientific phases of the subject. The platitudinous paper, while still in evidence, is less conspicuous, and the list of instruments designed for the improvement of operations is falling off.

A renewed interest in the physiology of the tonsil is manifested by such observers as di Donato, Luscher and Viggo Schmidt. Kaiser continues his observations on large numbers of school children. In a late issue of *The Journal of the American Medical Association* he brings a study of the end-results of tonsillectomy in a series of 1,200 children to bear on the question of indications. His work is of sufficient interest to justify the quotation of his conclusions in full.

Based on an analysis of the complaints of twelve hundred children with the results found three years later, and compared to twelve hundred children with similar complaints in whom operation was denied but who were also examined three years later, the following conclusions can be made bearing on the indications for tonsillectomy and adenoidectomy:

1. Mouth breathing is a definite indication for tonsil and adenoid removal.
2. Frequent attacks of sore throat and tonsillitis offer a definite cause for removal of tonsils.
3. Frequent head colds, relieved in 75 per cent of the cases, offers a definite indication for tonsil and adenoid removal.
4. Persistent enlargement of the cervical glands, when no other cause is found, is a just cause for tonsil removal.
5. Malnutrition, when other causes have been eliminated, will be improved somewhat and therefore may be considered an indication.
6. Chronic and recurrent discharging ears are an indication for the operation.
7. Unexplained fevers, in the absence of other indications, may be a just cause for tonsillectomy; but there is no guaranty that they will not recur, unless the fever comes from an obscure tonsil infection.
8. For the prevention of respiratory infections, such as laryngitis, bronchitis and pneumonia, no positive indication exists, as the incidence of these infections was not influenced favorably or unfavorably by operation.
9. The prevention of diphtheria and scarlet fever may be considered an indication, as the incidence of these diseases was slightly less in the group operated on; and when it did occur, the sequelae were less serious when the tonsils were removed.
10. The presence of positive or suspected evidence of the rheumatic syndrome manifestations, rheumatism, chorea and heart disease, is a definite indication for tonsillectomy in view of the lessened incidence of heart disease in the group operated on.

Other studies along similar lines have been conducted in various clinics. Notable among them is the work of Anthony, who reports the detailed data obtained from 220 questionnaires. Of the patients, 192 reported improvement in their general condition or in some important detail. Two of the number suffered some aggravation of symptoms. Delayed hemorrhages (first twenty-four hours) occurred in four, secondary hemorrhages in five and abscess of the lung in one. His observations substantiate the current opinion that the small, submerged type of tonsil frequently does the greatest harm and that its removal is likely to be of greatest benefit to the patient. He believes that tonsillectomy performed in childhood lessens the liability to nasal sinusitis and otitis media.

Von Lieberman, regarding the problem from the standpoint of practice, finds first of all that manipulations short of total removal may stir up serious complications such as acute nephritis, and he condemns such practices as slitting, wiping or forcible washing. (In the face of general concurrence with this idea, Oppikofer, in a recent article, still clings to the idea of tonsillotomy for children, although he makes exceptions in cases of nephritis and tuberculosis.) Von Lieberman further finds that puncture into the retrotonsillar tissues is likely to carry infection, and is to be avoided. Wiping the bed of the tonsil fossa after removal of the gland also promotes infection. He warns operators to take into account also that the operation is likely to interfere seriously with the nourishment of tuberculous and nephritic patients. He advises against sewing the wound shut, but recommends the ligation of all vessels.

ANATOMY AND PHYSIOLOGY

Neumann reports the finding of a mass of mucous glands "the size of a small plum" in the tissues of the velum palati extending to the hard palate. This was encountered during a tonsil operation on a woman, aged 25. The author regards the presence and infection of such glands as offering a possible explanation of peritonsillar abscesses occurring after tonsillectomy.

Donato, studying the precollagenic reticulum in the tonsil, finds that it exists in abundance in normal and pathogenic tonsils alike. The so-called "lattice fibers" have their origin in the perivascular tissues and are more abundant in hypertrophic tonsils.

Two papers by Ery Lüscher on the physiology and the biochemistry of the tonsil have appeared recently. Both report the results of examination of tonsil metabolism by the method of Warburg. It is found, first, that hypertrophic tonsil tissue produces more lactic acid and utilizes more oxygen than normal. A glycolytic ferment is demonstrated in tonsil and adenoid tissues, which is present not only in the parenchyma but in the subepithelial lymphocytes as well. In hypertrophic tonsils both the fer-

ment and the oxygen exchange are increased over the normal. These two functions differ in their intensity in the various lymph glands. The thymus is characterized by complete absence of the glycolytic ferment. Between the ages of 16 and 20 both these functions diminish in a pronounced degree (50 per cent). The metabolic rate is lower in spring and summer than in winter; it is not influenced by sex, and is high in the tonsil as compared with other glands.

Viggo Schmidt also presents several contributions on the function of the tonsil, but attacks the subject from a hematologic angle. His monograph outlines, first, a uniform technic for obtaining cell counts. He next demonstrates leukocytosis as a transient phenomenon of infection as opposed to the permanent leukocytosis of the leukemias. Acute tonsillitis produces the greatest leukocytosis. Adenoids in children do not cause any departure from the normal, nor do chronically enlarged tonsils unattended by symptoms.

In another place Schmidt describes the result of massaging healthy and diseased tonsils. The decrease of lymphocytes in the peripheral blood stream after massage he attributes to the forcing of some antibody from the tonsil into the blood stream. Massage during tonsillitis produced a polymorphonuclear leukocytosis.

PATHOLOGY AND BACTERIOLOGY

Tumors of the tonsil are comparatively rare and usually provoke some mention in print.

Kelemen reports a short series. Ormerod describes an angioma of the tonsil, a type of tumor rarely found in that location. Friend, in reporting a case of mixed tumor, briefly reviews the literature.

Freedman, reporting a case of mixed salivary tumor in the tonsillar region, reviews the anatomy and the microscopic changes which occur in the condition in some detail, and arrives at the following conclusions:

1. Mixed salivary tumors of the parotid may migrate to the inner side of the lower jaw and come to lie inside the oral cavity.

2. This migration may be explained by the persistence of aberrant embryonic sprouts from the primitive parotid tube.

3. The complex nature and the many peculiarities of the tissues which enter to form this type of tumor may be explained by its embryonic origin from mesoblast and epiblast.

4. From a pathologic point of view, our case is interesting and rather rare because of the many types of tissues it contained. The majority of mixed salivary tumors contain only a few types of cells.

5. Clinically, our case demonstrates the advisability of checking up by microscopic examination the roentgen-ray findings of tumors which appear to invade bone, and vice versa. A grave surgical error would have been committed if we had trusted our first roentgenogram.

6. Although this type of tumor is of slow growth, does not invade regional lymph nodes, and does not metastasize at a distance, we think it advisable to follow up even total removal of the tumor by the application of the gamma rays of radium to prevent the 45 per cent possibility of local recurrence.

Twelve excellent photomicrographs accompany the article.

Neumark reports a case of primary syphilis of the lingual tonsil. He is able to discover only five similar cases in the published reports of the last ninety years, and adds that primary syphilis of the mouth is found most frequently about the lips, then about the palatine tonsils and last about the tongue.

Ehrenfried, investigating the etiology of tonsilloliths, substantiates the belief that fungi may be at the bottom of them. He finds the tonsilloliths to be composed largely of calcium phosphate and bases their association with fungi on the affinity of the latter for lime salts.

Castellani writes on tonsillomycosis and stresses the importance of bearing it in mind in cases of ulceration of the tonsils, as it may simulate diphtheria, Vincent's angina or lacunar tonsillitis. The infecting mycetes are *Monilia, Oidium, Hemispora* and *Nocardia.*

Much attention is being directed by current writers to the bacteriology of tonsil disease and to its manifestations elsewhere in the body. Most of the work is not new, but serves to confirm or disprove our present conceptions.

Bacteremia associated with acute hemolytic streptococcus infections in the throat is the subject of a discussion by Ballenger. He divides *Streptococcus hemolyticus* into four types and discusses the channels of entrance and the remote complications following its entry into the blood stream. His conclusions, in his own words, are as follows:

1. A bacteremia secondary to an acute hemolytic streptococcic throat infection is probably of common occurrence, and possibly is the usual accompaniment of this type of infection.

2. This bacteremia, if present, is of a transient or evanescent character in the vast majority of cases, and is not accompanied by the usual signs of a "septicemia" other than an elevation of temperature.

3. In a small percentage of instances, the hemolytic streptococcus lodges and multiplies in some distal portion of the body, and gives rise to the secondary manifestations characteristic of this type of throat infection.

4. With an acute otitis media or an acute mastoiditis present, a positive culture of the hemolytic streptococcus from the blood stream is not of as great diagnostic import, so far as a thrombosis of the lateral sinus is concerned, as are the other pus-producing organisms.

Similar observations are made in children by Pilot and Tumpeer. They have found *Streptococcus hemolyticus* present in 97 per cent of excised tonsils. Swab cultures of comparatively normal children demonstrate it in 55 per cent. Two years ago Bell (reported in my review of 1924 in this journal) found it in 70 per cent during the winter months and in only 56 per cent during the summer. Both conclude that these organisms are normally found in the crypts of the tonsils.

Daland summarizes his observations on chronic tonsillitis as follows:

1. Latent or chronic infection of the tonsils or sinuses is not uncommon in adults.

2. Scarlet fever, diphtheria, influenza and streptococcic milk in childhood are often the primary causes of latent or chronic tonsillitis diagnosed late in life.

3. Systemic disease, secondary to chronic infection of the tonsils or sinuses, is associated with leucopenia, lymphocytosis and diminished polymorphonuclear cells in about 40 per cent of the cases.

4. The presence in pure culture of the streptococcus hemolyticus or viridans in the bottom of a crypt of a tonsil is diagnostic, the importance of which is increased when injections into animals prove that the streptococci possess pathogenicity and selectivity.

5. The presence of bacteria in sinuses possesses additional diagnostic value because these regions are normally sterile.

6. Latent or chronic sinusitis is often an unsuspected focus of infection and often coexists with infected tonsils and teeth.

7. A negative opinion in suspected chronic sinusitis should only be given after repeated examinations.

8. Closed infected ethmoid cells may be the cause of postoperative failure, even when free drainage has been secured.

9. Autogenous vaccines are valuable in asthenia, emaciation, anemia and in the aged.

The general subject of tonsil cultures was presented by Richardson in a more or less statistical form before the last (1926) meeting of the American Laryngological Association.

The much discussed angina agranulocytotica is the subject of a comprehensive article by Friedemann, which appeared in January, 1926. He states that tonsillitis is sometimes not a local disease, but may be due to diseases of the blood and of the blood-forming organs. The local manifestations may be extensive necrotic processes, whether the leukemia be myeloid or lymphatic. Two entities have lately been recognized, angina agranulocytotica and angina monocytica. At the time Friedemann's article was published, twenty-eight authentic cases of the former type had been reported, the first as early as 1904.

The following, one of Friedemann's cases, is a typical one:

A woman, aged 30, was admitted to the hospital six days after a curettage for abortion had been performed, without subsequent fever until the fourth day, when she became suddenly sick. Her temperature rose to 102.2 F., her throat became sore, and the bilateral tonsillitis which ensued was mistaken for diphtheria. Three thousand units of antitoxin were given. The pharynx was red, the left tonsil a grayish green, and the tongue was dry and heavily coated. There was some pus at the margins of the gums. The heart, lungs, liver and spleen were normal, but the blood picture was as follows: The red blood cells were slightly decreased; the platelets normal; there were no polymorphonuclear leukocytes present, lymphocytes being the only white cells found. The ulceration spread to the right tonsil and to the uvula, and on the tenth day after the onset of the disease the patient died.

The ulceration is not always confined to the throat. The skin, the urethra, the esophagus, the stomach, the small intestine, the colon and the anus have all been known to be affected. The prognosis is bad.

Agranulocytosis is differentiated from an acute myeloblast leukemia with an aleukemic blood by the absence of severe anemia and by the

hemorrhagic diathesis; also by the fact that the blood platelets are not decreased.

COMPLICATIONS

Complications attending diseases of the tonsils and operations are many, and unusual occurrences are constantly being reported.

Aberrant vessels in the pharyngeal wall are not uncommon, and operators have been cautioned repeatedly to search for them before attempting an operation. Dupuy, however, describes a case in which the pharyngeal mass was apparently an infiltration that was purposely incised. Ligation of the external carotid had to be resorted to in order to check the resulting hemorrhage. The author concludes that it behooves the laryngologist to train himself in the skilful ligation of vessels of the neck.

Patterson reports another case in the *Lancet,* in which hemorrhage continued for six days following the opening of a peritonsillar abscess, that also necessitated carotid ligation.

Two other observations on peritonsillar abscess are noteworthy. Hafer observes that peritonsillar abscess may occur without bulging, when scars of previous processes are present. He points out that as soon as an accumulation of pus occurs, paresis of the palatal muscles sets in, and he regards this paresis as an indication for incision.

Escat puts the question, "Why do apparent peritonsillar abscesses sometimes go to spontaneous resolution without evacuation?" He supplies three answers. He believes that a true abortive peritonsillitis may exist, but considers it rare. More likely, he believes, is the concealed spontaneous evacuation into a crypt or through the supratonsillar fossa. A third possibility is that the condition diagnosed as such is not a peritonsillitis, but a cyst, a simple tonsillitis, periostitis of the jaw or diphtheria of the supratonsillar fossa.

Hubert Jay, of Adelaide, makes the following observations on hemorrhage in tonsillectomy, based on a study of 200 cases:

1. Application of swabs to the tonsil fossa after enucleation defeats its own purpose and tends to increase rather than decrease hemorrhage.
2. The more gradual the process of separation, the less the hemorrhage.
3. Consistent with the proper performance of the operation, the less dissection the better.
4. It is desirable to secure anesthesia sufficiently deep to abolish pharyngeal reflexes. [Many operators are at variance with this opinion.]
5. Inflammatory states of the tonsil increase the risk of bleeding.

In this connection should be mentioned one or two accidents. Schall reports a case of postoperative hematoma of the soft tissues of the throat which necessitated an emergency tracheotomy. The tube was removed after two days, and uneventful recovery occurred. Jennings reports a post-tonsillectomy hemorrhage occurring during reaction to

atropine, which he attributes to the drug. The causal connection, however, does not appear to be clearly established.

An unusual cause of death following tonsillectomy in a child 2 years and 8 months old is reported by Tawse. The child, who had undergone an uneventful guillotine operation twenty-four hours previously, sat up to have its face washed, fell unconscious and died an hour later. Autopsy revealed a hemorrhage the size of a peanut at the center of the pons, which was considered as the cause of death. The thymus weighed 1¼ ounces (47.5 Gm.). All other organs were normal.

Hayden mentions a case of cervical emphysema, which occurred some hours after tonsillectomy and responded to applications of ice. The patient recovered shortly.

Zingher reports a case of diphtheria complicating tonsillectomy.

Jackson, writing on post-tonsillectomic pulmonary abscess, points out three routes of infection: the bronchi, the lymph channels and the blood vessels. He warns operators that pulmonary suppuration, usually an abscess, is a serious complication and should be considered in advising tonsillectomy. He considers acute, subacute or curable upper respiratory infection as contraindications.

Tucker reported to the College of Physicians of Philadelphia eleven cases of foreign body accidents during tonsillectomy. Before the same body, Clerf described a series of foreign bodies encountered in the tonsil itself. He mentioned fish bones, toothbrush bristles, spicules of various substances and stems of plants. He finds such accidents more frequent in patients wearing artificial dentures.

Glassberg discusses the hypernasality of speech following the removal of large adenoids, occasioning incomplete pharyngeal closure; he gives exercises for overcoming it.

Miller, in a report of a special subcommittee of the British Medical Association, on "Rheumatism and Heart Disease in Children," outlines the results of a careful study of forty-five children over a period of five years after tonsillectomy. One hundred and thirty-three controls were observed at the same time. It was found that sore throats, carditis and arthritis improved. Muscle pains sometimes disappeared, but the improvement was gradual. Chorea was unaffected. The importance of clearing up other foci of infection is stressed.

TREATMENT

The general subject of tonsillectomy is considered from several angles by many authors.

Fraser, in two articles in the *Lancet,* discusses the choice of methods in chronic tonsillitis and tonsillectomy in adults and children. Pratt writes on the results of tonsil operations.

Stern presents an interesting routine for the postoperative treatment of the throat in singers. He emphasizes first the especial importance of careful operative technic to avoid injury of the musculature of the throat. He regards the practice of resting the throat for six weeks as bad, and recommends that vocal exercises be begun as early as two weeks following the operation in order to prevent rigidity from scarring. Under these conditions, he finds that tonsillectomy improves the voice, permits the singer to handle it more flexibly and reduces fatigue. Numerous vocal exercises are presented in musical notation.

An article by Hill entitled, "What is wrong with the tonsil operation?" were better named "What is wrong with tonsil operators?" as he attacks less the operation than the faulty accomplishment of it. This he does under two heads: faulty operative technic and incorrect diagnosis, listing under the latter inattention to predisposing factors, lack of careful clinical study and interpretation, and ill-advised time of operation.

Spencer recommends the chewing of gum after tonsillectomy to prevent the stiffening of the muscles and to keep the fossae clean. It also prevents the bad taste usually present, and preserves the appetite.

Suchanek also writes on local healing after tonsillectomy.

After a careful study of methods, Ohnacker expresses himself in favor of the Sluder technic with ethyl-chloride anesthesia for children.

McNab, reviewing the methods in vogue, arrives at the same decision, although he prefers ether and oxygen and the locked guillotine in patients from 13 to 17 years of age, and the scissors and snare under local anesthesia for those over 18.

Gowen outlined the tonsil technic under nerve block anesthesia in the April (1926) issue of the ARCHIVES OF OTOLARYNGOLOGY.

Salinger reported to the Chicago Laryngological and Otological Society the case of a man, 59 years old, with an infiltrating cauliflower mass of the right tonsil, anterior pillar and base of the tongue, with deep enlarged cervical glands which were dense and fixed. Apparent cure (for one year and up to the time of publication of the article) was effected by means of implants of twenty radon seeds (10 millicuries). Healing was complete in six months, with some scar formation, and the cervical adenitis disappeared.

Fraser also mentions a case of lymphosarcoma of the tonsil in a child of 5 years, apparently cured by radium implanted into an incision in the lateral part of the soft palate.

New instruments reported embody only minor changes in pattern and no significant departures in principle.

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News and Comment

RESEARCH WORK BY AMERICAN OTOLOGICAL SOCIETY

The Board of Trustees of the Research Fund of the American Otological Society, Inc., announces the completion of its first year's activity. The central bureau is now located in a permanent office in the New York Academy of Medicine, Fifth Avenue and 103d Street. The primary object of the research is an intensive, correlated study of chronic progressive deafness and otosclerosis, and subsequently other problems in otolaryngology. To this end a permanent endowment fund known as the Research Fund of the American Otological Society, Inc., is being raised.

The Carnegie Corporation donated $90,000 for this research to be distributed over five years, the expenditure of which will be under the direction of the Scientific Committee appointed by the society and the Lay Advisers of the Board, who are Starling W. Childs, George E. Coleman, William J. Curtis and J. DuPratt White. The Board of Trustees of the Research Fund—Dr. Arthur B. Duel, Gen. Herbert S. Birkett, Dr. Eugene A. Crockett, Dr. Edward B. Dench, Dr. James F. McKernon, Dr. Norval H. Pierce and Dr. J. Gordon Wilson—hopes to be able to raise a permanent fund of at least $500,000, the income of which shall be devoted to research. It is the intention of the board of trustees to utilize the interest on such sums as are collected for the permanent fund to augment the budget provided by the Carnegie Corporation for this research until the permanent fund is completed. More than $100,000 has already been subscribed to the permanent fund.

Among the projects now being conducted under the direction of the Scientific Committee are the following:

1. Review and translation of literature on otosclerosis. When completed this will be published and sold at cost.

2. Investigation of the anatomy of the osseous capsule of the labyrinth, including the study of animal material in connection with nutritional disease.

3. Investigation of experimental metabolism.

4. Investigation of the development of the bony capsule of the internal ear.

5. Investigation of the experimental production of the pathologic changes of otosclerosis.

6. Collection of autopsy material in several centers.

To insure the success of the project, the committee enlists the interest of the whole medical profession as well as of the lay public. It considers the problem of this research second to none in importance to the profession and to the world at large, and physicians are urged to do their part in this work by assisting in the financing and in other ways and by stimulating others to join in the movement. The money received will be used for the prosecution of both laboratory and technical work and for the maintenance of the bureau of statistics which will assist in avoiding needless repetition of work. Subscribers to the fund will receive from the central bureau all important bulletins and communications published. Contributions should be sent to the American Otological Society Research Fund, William J. Curtis, Treasurer, New York Academy of Medicine, Fifth Avenue and 103d Street, New York City.

Abstracts from Current Literature

Ear

Membrana Tympani Picture and Pneumatization of the Mastoid; A Roentgenologic Study. Brock, Tr. German Otol. Soc., Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:241 (Nov.) 1926.

For the past two years in the Erlangen clinic roentgenograms have been made on both sides in all cases involving the ears, even in unilateral disease. The author is of the opinion that the degree of pneumatization of the mastoid is of great significance in the course of acute otitis, and in the occurrence of chronic suppuration. He has never seen perforation of membrana Shrapnelli and cholesteatoma in a normally pneumaticized mastoid. He states that a typical normal membrana tympani is conclusive of a normal pneumatization of the mastoid. He credits Mouret, of Montpellier, and Heine as the earliest otologists to contend that osteosclerosis is not the result but the cause of suppuration, preceding Witmaack, to whom he gives the credit for working out magnificently the scientific evidence of this theory. According to Witmaack, the filling in of the mastoid cells with bone following inflammation is impossible. In 60 per cent of the author's unilateral chronic suppurative cases both mastoids were identical in structure. Compact mastoids were also found in cases of healed suppurative processes; and in nonsuppurative cases when the membrana tympani showed a high degree of depression (retraction), the membrana flaccida was atrophic and sunken, and the Rivinian fissure appeared wider. The sinking in may deceive one into believing that it is a dry perforation. All such cases seen by him were accompanied by a more or less compact mastoid. Many of these patients were of adenoid habitus or gave a history of mouth breathing. Sinking in of the pars tensa and opacity were associated with only mild deviations from the normal in the mastoid structure. He also examined all the cases of tubal obstruction, especially those without an acute history, and found in all patients more or less inhibition of pneumatization.

The author is of the opinion that not only the infantile otitis, which Witmaack believed to be the cause of nonpneumatization, but any condition of the tube or of the middle ear that prevents aeration of the tympanic cavity may be the cause of nonpneumatization; in other words, he believes that the ingress of air to the tympanic cavity supplies the stimulation for normal development of the mastoid process.

The article is illustrated with a series of excellent roentgenograms.

Anatomic Studies of the Development of the Tympanic Mucosa, and Its Relation to the Pneumatization of the Mastoid. Steurer, Ztschr. f. Hals.- Nasen.- u. Ohrenh. **15**:261 (Nov.) 1926.

According to Witmaack, the pneumatization of the mastoid is dependent on the resolution of the myxomatous filling tissue of the tympanic cavity into a thin mucoperiosteal lining. The author's report is based on an examination of 100 temporal bones (230 more are in preparation) to answer the question: What objective relationship is there between the condition of the tympanic mucosa and the pneumatization of the mastoid? Four types of mucosa are described: (1) a thin mucoperiosteal lining, of few cell layers, covered by flat epithelium; (2) hyperplasia of the mucosa, especially developed in the bays and niches; (3) fibrous mucosa, and (4) fibrillated, scanty-celled connective tissue with much elastic

tissue. The second and third types may be combined, the deeper layers being fibrous, and the superficial layers loose, more or less cellular and with cystlike spaces. All these types are well shown in the illustrations.

Of the 100 bones, fifty-one were normally pneumaticized. Of these fifty-one, forty-seven showed mucosa of the first type. The other four showed mild changes in the mucosa in two cases and severe changes in two cases. Of the two severe cases, one was fibrosed; the other showed a thick fold in the niche of the round window.

Sixteen bones showed high grade inhibition of cell development; nine of these showed high grade hylperplasia of the mucosa; six showed high grade fibrous or fibrohyperplastic changes.

Of thirty-three bones showing various grades of failure of pneumatization, nineteen showed definite hyperplastic changes, ten showed fibrous hyperplastic changes and four did not show any change in the mucosa in proportion to the changes in the bone.

These cases were all those in which there was no history of ear trouble. The author realizes that history is not infallible, but thinks that a large number of observations tends to diminish the percentage of error from this source.

Discussion of the foregoing papers.—Krainz claimed that he had established that it is possible to have sclerosis of the originally pneumatic mastoid as the result of endostitis later.

Alexander did not understand how the researches of Brock and Steurer supported Witmaack. Brock spoke of osteosclerosis, but showed only diploetic and pneumatic mastoids. The four types of changes in the mucosa described by Steurer may occur in various places in the same specimen, and Alexander thought that the changes shown were pathologic and not the result of merely disturbed resolution from the original myxomatous material. He thought these cases might be accepted as developmental defects only when the patients had had a functional test during life showing normal ears.

Witmaack challenged Alexander to show a temporal bone demonstrating the four types of mucosal change in the same specimen.

Steurer contended that, even though in some of his reported cases the patients may have had a chronic adhesive process in life, this did not produce the changes in cell development. Many patients with normal hearing show the same changes.

INDICATIONS FOR AND TECHNIC OF THE EARLY OPERATION IN ACUTE MASTOIDITIS. H. NEUMANN, Proc. German Otol. Soc., Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:273 (Nov.) 1926.

The time for a mastoid operation is before there are any complications and when the process in the mastoid is developed to a degree that spontaneous resolution is improbable. The surgeon should be able to decide that the operative intervention is less dangerous than the disease itself. Indications may be absolute or relative. Probability of intracranial complication may be considered an absolute indication. Relative indications are those whose importance depends on the duration of the disease, such as pain, tenderness, profuse secretion, sinking of the canal wall, papilliform elevations, which bespeak anatomicopathologic conditions early in the course, different from those seen when these symptoms develop later. The age of the patient, his constitution and the etiologic factors influence the changes in the mastoid as much as does its anatomic construction. Clinical experience helps in judging virulence and resistance. For instance, the different course of inflammation of the ear in scarlet fever and measles as compared with the course of inflammation resulting from ordinary colds, and the variations in different epidemics are known.

In the majority of cases the indications are not urgent, and on the basis of clinical experience it is customary not to undertake an operation within the first ten days or two weeks of the onset of the otitis media. A delay of a few days allows the infective process to quiet down and become walled off, making the operation technically easier. On the other hand, there is increasing risk of complications. The author quotes statistics to show that, in general, complications increase with the duration of the otitis. In 104 cases in Neumann's clinic, sixteen patients were operated on early, that is, before they had had the disease two weeks. The author states that with the ordinary technic used in operation on the mastoid experience has shown that early operation may fail to control the spread of infection and may lead to complications or at least to a second operation. At best, the healing process is longer, and some authors state that persistent fistula is more frequent. The author states that these objections are overcome by the technic followed in his clinic, where the operation is carried out according to a definite system. After opening into the antrum, the root of the zygoma is reamed out until compact bone is reached; the retrofacial group of cells (if not presenting) are sought out and opened as widely as possible; then the tip cells, the retrosinus and peribulbar cells are removed down to the sinus plate. Then the petrosal angle is carefully sought out and cleaned out down to the hard inner plate. The cells at the tegmen are cleaned out, and here it is to be remembered that there may be a double deck of bone with cells between. These cells are exenterated, even when they are empty and appear normal. Of course, this leaves a large operative defect, and in forty-seven of the author's cases the dura or sinuses were uncovered, but without any ill effect. Therefore he believes that it is better to have this exposure than to leave doubtful bone. Since this technic has been followed, there have been no secondary operations and no complications.

MASTOIDISMUS AND MASTOIDITIS. FISCHER, Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:283 (Nov.) 1926.

The local mastoid symptom complex, during the first week of otitis media should be diagnostically distinguished from that of suppurative mastoiditis, and this is best done by accepting the term mastoidismus (Alexander). Mastoidismus heals under conservative treatment, but is converted into a suppurative disease by operative intervention.

SINUS THROMBOSIS; CEREBELLAR ABSCESS, MENINGITIS. RECOVERY AFTER OPENING THE CISTERNA PONTIS: BLAU, Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:289 (Nov.) 1926.

A patient entered the hospital with stiff neck, general hyperesthesia, somnolence, vomiting, vertigo and headache. The otoscopic picture was that of suppurating cholesteatoma. Kernig's sign was positive; the labyrinth reacted. A radical mastoid operation was performed, with removal from the sinus of a suppurating thrombus and excision of the wall into the healthy region, uncovering of the middle and posterior fossa. Twenty cc. of cloudy spinal fluid was withdrawn. A colloidal suspension of silver was injected intravenously and methenamine was given by mouth. Increasing stiffness of the neck led to further lumbar punctures, which finally showed occasional gram-positive diplococci, but these were sterile on culture. Several days later the lumbar puncture was dry; therefore, a block was present.

Further exposure of the dura mediad of the sinus, uncovered a small bean-sized abscess of the cerebellum; further lifting of the dura along the pyramid

released a teaspoonful of foul pus from the region of the saccus endolymphaticus. Finally, the cisterna pontis was reached and incised, with an outflow of a large amount of fluid, which was at first cloudy, and later was clear; a gauze drain was inserted. There was prompt improvement, but on the fifth day there was a marked rise in temperature; the gauze drain was pressed out of the cisterna; a probe was inserted with an outflow of some clear fluid. Recovery was uneventful.

Although trypaflavine and methenamine and other medication were used, the prompt improvement after drainage of the cisterna was too definite to allow any doubts as to its efficacy.

CONTRIBUTION TO THE PATHOLOGY OF SUBDURAL ABSCESS: LIEBERMANN and PETZAL, Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:294 (Nov.) 1926.

This is defined as a suppurative process between the layers of the dura or immediately under it, with only localized involvement of the leptomeninx.

A patient, aged 18, who had refused radical mastoid operation a year before, was brought into the hospital with a history of chills and fever of three weeks' duration. The fever had diminished, but headache had increased a few days before she came to the hospital. There was profuse fetid discharge from both ears. The tendon reflexes on the left side were increased; there were adiadokokinesia and hypotonia on the right side. A radical mastoid operation was performed on the right side. The entire mastoid process was cholesteatomatous; the sinus was thrombosed; the dura was smooth and shiny, but a yellow-green discoloration showed through, and fetid pus was discharged from a pea-sized fistula. The spinal fluid, originally cloudy, was clear for two days after the operation. Two days after operation there was optic neuritis on the left (contralateral). Three days after the operation there was increasing dyspnea followed by death. An autopsy showed that death was due to pneumonia; there was compression of the right cerebellar hemisphere; the uncovered dura showed thickening between it and the arachnoid; the sinus sigmoideus and transversus on the left side and the sinus longitudinalis were thrombosed.

An epicrisis occurred after the activity of the sinus thrombosis had subsided, and the subdural abscess was several weeks old. Pathogenically, several factors seemed to be present: a long-drawn battle between invaders and body resistance and cholesteatomatous erosion of the bone, permitting enlargement of the abscess without pressure symptoms. There are nearly always other complications, so that the diagnosis of subdural abscess is usually made only at operation. The best clinical guide seems to be clearing up of spinal fluid with increase or persistence of clinical symptoms. The prognosis is fair; in twenty-seven reported cases there were fourteen recoveries.

THE PROBLEM OF BONE CONDUCTION: EXPERIMENTAL DATA. KRAINZ, Ztschr. f. Hals,- Nasen- u. Ohrenh. **15**:306 (Nov.) 1927.

Temporal bones recently removed from a cadaver were fastened in a Broemser vise. Then the tympanum was opened from above, the hammer bands being left intact and a mirror of 2.5 mm. diameter and 1 mm. thickness fastened to the head of the hammer. Another method was to remove the labyrinth and to fasten a mirror to the labyrinthine side of the footplate of the stapes. The beam of light was transmitted through a crack to a film running on a kymograph. At the same time another mirror was fastened to the angle of the upper pyramid or to the plate of the vise parallel to the ossicular

mirror and its beam of light was similarly registered. The contra A tuning fork was used to produce the vibrations registered. According to Frank, the elasticity coefficient of the ear of the fresh cadaver is about the same as that of the living subject. Frank and Broemser have calculated that the factor of inertia of the ossicular chain is increased 1 per cent by the mirror; by removal of the labyrinth, it is decreased about 10 per cent.

1. Under "normal" conditions the curves show that the ossicular chain vibrates with greater amplitude than the temporal bone. The phase differs from one-tenth to one-twentieth wave length.

2. By closure of the external canal the amplitude of the chain is relatively increased; with the same difference in phase as in normal conditions. If one assumes that this is due to greater movement of fluid in the labyrinth it explains the increased loudness of bone conduction on closure of the external canal.

3. Increased air pressure in the external canal causes decreased amplitude of the chain and the difference in phase disappears. This condition is analogous to tubal obstruction. The increased bone conduction is attributed to disappearance of the difference in phase.

4. When the canal is filled with mercury; the difference in phase disappears and the amplitude of the chain is increased. Both components combine to increase movement of the fluid and represent the optimal hearing effect. In the living, this experiment gives greatly increased bone conduction.

5. When the canal is filled with water; the amplitude of the chain is greatly increased, and the difference in phase increases to one-fourth wave length. In the living the result is the same as with mercury. It is believed that the greater amplitude, and therefore the movement of the fluid is sufficient to overcome the difference in phase. In the Gellé test the sudden compression of air also compresses the air in the closed tympanum restricting movement of both windows and decreasing hearing.

Considerable discussion of other factors follows, such as the normal vibration period of the chain and its heightening undertension.

One may say that difference in amplitude alone improves hearing; difference in phase alone decreases hearing. But both are operative at the same time, so the hearing is affected by the predominance of one factor over the other; hearing is best when both factors coincide.

Krainz' conclusions are: The human ear is plainly designed principally for air conduction. The essential physical construction of the conduction apparatus, its factor of inertia and its coefficient of elasticity, are to be looked on as inhibiting hearing by bone conduction.

When it is considered that clinical experience and experimental data proving that changes in the outer and middle ear influence hearing, and that under these conditions transmission through the solid labrynth wall per se remains unchanged, it may be said that the kind and nature of the vibrations of the ossicular chain definitely influence the hearing through bone conduction.

Scientific Fundamentals of the Correction of Defects in Hearing. Bruenings, Ztschr. f. Hals,- Nasen- u. Ohrenh. **15**:318 (Nov.) 1927.

It is necessary to differentiate a qualitative and a quantitative loss of hearing, whether the defect is of mechanical or of nervous origin, and any instrument designed to correct loss of hearing must be able to overcome either or both of these difficulties. Mere increase in intensity of sound is not sufficient

for the understanding of speech. It may do for the hearing of music, although much of the quality of tones is lost. A microphone with a disturbing fundamental tone or adventitious sounds (carbon particle vibrations) cannot reproduce properly the sounds of speech whose vowels and consonants lie in partial tone groups (the Helmholtz formants). The deaf person, whose deafness may be for either high or low tones, often hears sound well enough, but cannot distinguish the words; that is, he cannot understand speech, because he is incapable of perceiving the principal partial tones of the vowels and consonants.

By means of an acoustic projection apparatus, which accurately reproduces and amplifies sounds with their overtones in proportion, so that the timbre is properly preserved, the author demonstrates his thesis (the instrument is capable of varying the intensity of any part of the scale) by the following experiments:

The tone of a so-called electric piano is throttled by means of a series of filters so as to eliminate a group of overtones; the result is a softer, flutelike quality.

The fundamental tones are throttled, resulting in an overtone of rich timbre, resembling the tone of the oboe.

A tuning fork is struck with metal, the overtones are throttled, and the result is the soft tone like that produced when the fork is struck by the rubber hammer. Incidentally, this instrument shows that the weighted Edelmann forks are not entirely without overtones.

Other experiments were made with the violin, showing that considerable loss of high tones is necessary before it is heard as a flutelike sound; with the telephone bell, showing the effect of labyrinth deafness (loss of high tones) and with an automobile horn, showing the changed tone as perceived in conduction deafness (loss of low tones).

Further tests were made with human voices, two sopranos, an alto, a tenor, a baritone and a bass, showing that the formants (principal partial tones) for the vowel "a" and the vowel "e" were practically the same for all the voices, thus proving by a scientific test what Helmholtz had intuitively perceived.

Tests were also shown with selected lists of words, with both deep masculine and high feminine voices, throttling from 5,000 cycles up. This test showed a change in timbre and difficult hearing for "i" and "e." Throttling from 3,000 on, caused errors in hearing to creep in.

In everyday life deaf persons learn to use secondary psychologic, acoustic and optic aids to understanding.

The loss of hearing for speech is much less when low tones are throttled 300 cycles downward, as the formants lie mostly in higher registers, and can be compensated more easily by raising the voice. So deafness of the middle ear type is more a problem of intensity. As whispered speech is lacking in fundamental tone, and consists largely of the formants, it is far more difficult to understand than conversational tones.

These tests explain the inefficacy of the present aids to hearing, and point the way for research. A scientific correction based on accurate analysis of the hearing will be the focus of otologic research in the near future. "We find ourselves at the cradle of a new otologic era."

The author says that otology is now able to produce, even if only with laboratory apparatus, something comparable to the work of modern ophthalmology.

Credit for this advance is given to a considerable number of investigators, both in physics and in otology, whose recent rapid increment is due to new knowledge of transformation of electric energy into acoustic properties, the radio development of high frequency technic and the discovery of the electron tube amplifiers.

THE EXACT HEARING TEST WITH THE OTOAUDION. GRIESSMANN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:333 (Nov.) 1927.

An instrument is described which produces by electricity pure tones of desired intensity and pitch between 80 and 2,800 cycles. It is especially adapted to test the hearing for the range that includes the formants of the vowels and consonants, charts of which are published. (These would, of course, differ somewhat for the English language.) According to the author, this gives a good idea of the patient's ability to hear speech, and can also be used to differentiate deafness of central (retro-cochlear) origin, in which the patient has hearing for consonants and vowels, but fails to understand spoken language.

A NEW APPARATUS FOR SEVERE DEAFNESS. FLATAU, Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:340 (Nov.) 1927.

A two tube amplifier of simple construction is shown, which the author claims is successful in cases of deafness of the highest grade.

LEWY, Chicago.

Pharynx

ADENITES AND PERIPHARYNGEAL ABSCESSES OF SYPHILITIC ORIGIN. H. CABOCHE, Arch. internat. de laryngol. otol. rhinol. **6**:28 (Jan.) 1927.

The aim of the report is to call attention to the peripharyngeal adenopathies of syphilitic origin which attack the posterior (retropharyngeal or ganglion of Gillette) and lateral pharyngeal ganglions, especially those occurring in the adult.

Adenopathies occurring in secondary syphilis are well known. They are less frequently recognized because they are more rare than are adenopathies which occur late in the infection by the spirochete. The classical treatises do not include them, and they are not found in a careful review of the literature. They constitute isolated symptoms, which are of themselves important. The author believes that certain of the retropharyngeal and lateropharyngeal abscesses are of unusual interest.

Retropharyngeal (ganglions of Gillette) and lateropharyngeal adenitis with sudden onset in the adult should be regarded as suggestive of syphilis. If they are accompanied by other manifest syphilitic lesions, the diagnosis is obvious. If they appear as isolated symptoms, they should be regarded suspiciously. Palpation of the suboccipital glands should not be overlooked in retropharyngitis and lateropharyngitis. If the patient is seen during the period of suppuration, one should think of syphilis on account of the slow course, delayed healing after incision and finally the response to antisyphilitic treatment. It is only indirectly, by curing the adenopathies, that the suppuration is stopped.

Six cases were reported, two of which were only probably syphilitic, but the patients responded rapidly to antisyphilitic treatment.

ROTH, Kankakee, Ill.

REMOVAL OF FOREIGN BODIES FROM THE ESOPHGUS. A. I. FELDMANN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **16**:612 (Nov. 8) 1926.

The antiquated procedure of using a sound to locate foreign bodies in the esophagus must be condemned. Frequently a mediastinitis or a perforation into the trachea results in pneumonia, injury to the aorta or a phlegmon of the neck. If a foreign body is left, a hypertrophy of the wall and a thickening of the surrounding tissue result as protective measures. Even if the mucous membrane is torn, good protection is furnished by the muscular layer.

Cases have been reported in which foreign bodies were in the esophagus three years (Koenigstein), sixteen years (Schmidt, cited by Wojatschek) and seventeen years (Bradenkyle, cited by Jackson). A coin rested for three years in the esophagus, a dental plate ten years (Tapia) and another six years (Willoughby, cited by Bruening and Albrecht). Feldmann removed a large bone which was located for thirty-six days in the esophagus without any injurious effect. It is only in rare cases that patients cannot take nourishment on account of a foreign body in the esophagus.

Among other complication must be mentioned the injury of large vessels which is caused by manipulating foreign bodies with sharp edges. Paulet's statistics comprise thirty-three such cases. The aorta was injured seventeen times, the carotid artery, the subclavia, the thyroid and the pulmonal artery more rarely.

The author describes three cases seen by him. The first patient had first refused esophagoscopy. After thirty-six days, a large piece of bone was removed with the aid of esophagoscopy at a distance of 35 cm. from the teeth, namely, from a spot in the esophagus corresponding with an anatomic narrowing.

The second patient, a child, aged 3, had swallowed a coin. A physician had tried to push the coin downward with an olive-pointed probe. Necropsy showed that the esophagus was perforated in the upper third. A false channel led to the loose periesophageal tissue, downward to the cardia. A hemorrhage had occurred in this tissue. Catarrhal pneumonia and edema of both lungs were present.

The third patient, a woman, aged 59, had swallowed a fish bone. A physician used a probe three days in succession. On the fourth day, the author was consulted. He used the esophagoscope and found the fish bone 18 cm. from the teeth. It was easily removed. Four days later, the tissue of the neck became infiltrated, and a bilateral mediastinotomy was performed, parallel to the sternocleidomastoid muscle from the mastoid process to the jugulum. Pus was found and drained. The patient succumbed the next day. Necropsy showed a perforation of the esophagus in the region of the throat, periesophagitis purulenta and sepsis.

The upper third of the esophagus is most exposed to perforation on account of the contraction of the cricopharyngeal muscle. The author issues a warning concerning the dangers accompanying the use of the probe. The esophagoscope must be used.

THREE TUMORS OF TONSILS. GEORG KELEMEN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **16**:556 (Nov. 8) 1926.

Kelemen describes an accessory tonsil of the right arcus palato-pharangeus in a patient, aged 22; a myoma emanating from the right tonsil in a medical student, aged 27; and a lymphosarcoma of the right tonsil and the adjacent parts of the pharynx and throat in a patient, aged 66. The patient last men-

tioned came to the clinic in November, 1926, complaining of difficulty in swallowing, which had existed for years, but which had become rapidly worse within three months. The tumor was the size of an apple, with metastases in the glands in the right mandibular angle. The Wassermann and Sachs-Georgi reactions were 4 plus. The patient denied that he had syphilis.

Loré has described a similar case (*Laryngoscope* **34**:477, 1924), that of a patient who had a 4 plus Wassermann reaction, although syphilis was not given in the anamnesis. Arsphenamine was used without success. Kelemen's patient suffered from difficulty in breathing; therefore the right tonsil was removed by blunt dissection, with surprisingly little hemorrhage. Later frequent hemorrhages occurred from various parts of the tumors. The patient died in May, 1926.

AMBERG, Detroit.

Larynx

MICROBES IN THE UPPER SPACE OF THE HUMAN LARYNX. WALTER KLESTADT, Ztschr. f. Hals-, Nasen- u. Ohrenh. **17**:170 (Jan. 31) 1927.

Klestadt mentions the observations of Hasslinger and Sternberg in the study of microbes in the larynx. He constructed an instrument to obtain the material. It is built like instruments for surgical intervention by indirect endolaryngoscopy. A movable stem travels through a tube. The stem is wrapped with cotton which is protected from contamination while it is being introduced. The instrument is sterilized dry. Of course, not all the germs could be procured in this manner. Among twenty-five patients, two furnished no microbes. Pneumococci were the principal microbes found (nineteen times). When it is considered that some catarrhal diseases are not produced by microbes which come from outside and when it is known that, in catarrh and inflammation microbes are almost always present in the upper laryngeal space, it can be assumed that primary catarrhal diseases of the larynx are caused by microbes in this space.

BEL CANTO REGISTRATION BY A PUPIL OF GARCIA. E. W. SCRIPTURE, Ztschr. f. Hals-, Nasen- u. Ohrenh. **17**:196 (Jan. 31) 1927.

Herman Klein, born in 1856 in Norwich, England, was a pupil of Garcia for four years. Songs were sung into an apparatus for graphic registration. The air current was absolutely constant (sostenuto). There was no tremolo as is common at present. Toward the end the wave line rose a little. This increase in strength of the vowel before a consonant was always present in Klein's singing. Caruso also used this peculiarity constantly. It is to be supposed that such a sharply defined transitional change from vowel to consonant is essential for a clear expression in bel canto. This is important for telephoning. The beginning of each vowel showed, in Klein's singing, entirely clear and perfectly formed waves, a testimony for a correct onset. It would be interesting to compare these curves with those produced by modern singers.

AMBERG, Detroit.

Nose

PRELIMINARY REPORT IN THE STUDY OF THE NASOFACIAL REFLEX. SARGNON, COLRAT and MOUNIER-KUHN, Arch. internat. de laryngol. otol. rhinol. **6**:18 (Jan.) 1927.

An historical review was made of the various reflexes related to the nasofacial reflex (and the ideas furnished which led to this study).

The technic was carried out in five series. In the first three, the reflex was provoked by placing a tampon saturated with epinephrine hydrochloride in contact with the posterior end of the middle turbinate for two or three seconds. In the first series, the facial and conjunctival reactions were observed. In the second, the retinal arterial tension was studied with a Baillart tonometer before and after producing the reflex. In the third, the retinal arterial tension was studied before and from thirty-five to forty seconds after producing the reflex. In the fourth series, the tampon was left in contact with the posterior end of the middle turbinate for ten seconds, and the changes in the caliber of the retinal vessels was observed. In the fifth series, the anterior end of the middle turbinate was stimulated with epinephrine hydrochloride for ten seconds, and the retina was studied.

Even with such a feeble excitation employed the nasofacial reflex was observed in all the twenty-one cases. The conjunctival congestion and lacrimation was fairly constant. The pulse rate was lowered in all but three cases. The retinal tension was studied in ten cases. The lesser component of the tension was lowered in four instances, the greater in three, and in one there was no change. The lesser component was raised in three instances, the greater in three, and in one there was no change. In one instance the lesser was lowered and the greater was raised. Of three cases in which the retinal vessels were studied by excitation from the posterior end of the middle turbinate, only one case showed dilatation. When the excitation arose from the anterior end of the middle turbinate no change was found in the retinal vessels.

Two clinical cases were reported, but in only one was the retinal arterial tension studied, and this showed a marked lowering of the tension following endonasal intervention on the ethmoidosphenoid.

ROTH, Kankakee, Ill.

ENDONASAL ACCESS TO THE FRONTAL SINUS. LAFITTE-DUPONT, Arch. internat. de laryngol. otol. rhinol. **6**:35 (Jan.) 1927.

The endonasal route of operating on the frontal sinus has been condemned by some surgeons. The author reviews the anatomy of the frontal sinus and of the infundibulum and also calls attention to the anomalies which are responsible for many of the failures and accidents in the endonasal operation.

The technic requires a roentgenogram to ascertain the anatomy and the anomalies of the sinus. After removing the middle turbinate, a curved hook is introduced into the infundibulum from below upward and from behind forward, and the anterior lip is resected as high as possible; another curved hook is now introduced into the infundibulum, and the sinus is entered. By working forward, the floor of the sinus is resected with rasps and convenient instruments. Care should be taken not to injure the orbit, lachrymal bone and cribriform plate.

TREATMENT OF RECENT AND OLD FRACTURES OF THE NOSE. A. SARGNON, Arch. internat. de laryngol. otol. rhinol. **6**:129, 1927.

Open fractures and fractures received in war were not included in the treatise, because the author had covered them in a previous work. Only the closed fractures commonly encountered in civil pursuits were considered.

An interesting review of the literature which led up to the modern method of handling closed fractures of the nose was included.

Treatment should be instituted in recent fractures as soon as possible, except when severe hemorrhage and edema prove to be serious complications. Reduction and maintenance of these fractures are comparatively easy.

In old fractures of the nose in which there are flattening and both external and internal deformities, real difficulty is encountered. Adhesions and great deformity of the septum are corrected as a preliminary procedure. Large exostoses can be corrected by the internal route. Dissection is carefully carried to the excess of tissue, which is removed with gouges and rasps. Loss of substance of the ridge is supplied by grafts of cartilage and bone. The graft from the tibia is used most often because it is easier to handle, and larger grafts can be obtained. Fat and muscle do not supply a ridge of sufficient firmness.

When extreme deformity with displacement occurs, osteotomy and osteoclasia are employed. When the septum is intact, a preliminary dislocation of the septum is produced. An incision along the pyriform crest leads to an elevation along the superior process of the maxilla. With a long, thin, double-shouldered gouge the nasal bone is separated from the maxilla. Following this, the frontal and orbital sutures are broken by manipulation. It may be necessary, however, to resort to osteoclasia of the frontal suture. This is accomplished with a gauze-covered massette and a mallet. This procedure renders the nose freely movable. Reduction is perfected, and the external-internal splint of Molinie is suitably adjusted. There is little postoperative difficulty. If there is a flattening of the ridge, this condition can be corrected later by a living graft.

TUBERCULOSIS OF THE NASAL FOSSAE. HENRI RETROUVEY, Rev. de Laryngol. Jan. 15, 1927, p. 15.

All manifestations of tuberculosis occurring intranasally except cutaneous lupus are considered. Primary tuberculosis is thought to be rare, usually latent and of slow progress. The author describes the lesions under five headings:

1. Ulcerative lesions, which generally make their appearance suddenly in advanced tuberculosis. The sites of election are the anterior-inferior portion of the septum, the extreme anterior portion of the lower turbinate and the adjacent floor of the nasal fossa. The subjective symptoms are slight; there is a burning sensation, but little or no obstruction or secretion. The general appearance of the mucous membrane is pale. There may be one or more superficial ulcerations, the irregular margin of which blends with the surrounding sound tissue. The floor is gray-red, uneven and often covered with crusts. These may be yellowish granulations in the vicinity of the ulcerations.

2. Larval lesions, in which the only means of arriving at a diagnosis is by a study of the pathologic anatomy. The microscopic section shows tuberculous follicles, giant cells and bacilli. The symptoms are essentially disappointing. The subjective symptoms are those of hypertrophic coryza, with watery discharge and obstruction. The appearance is that of ordinary hypertrophic coryza. There are no ulcerations, although true bacillary ulcerations have been observed after turbinectomy. The course is benign, and the condition responds to appropriate treatment.

3. Pseudo-atrophic lesions, which Moure is quoted as describing as indicative of a prebacillary tuberculosis. Microscopically, one finds only common chronic inflammatory changes. The symptoms and observations resemble those of atrophic rhinitis, from which this condition must be differentiated. The general appearance of the patient is that of adolescence, with lymphatic facies, soft, waxy flesh, large lips and physical and mental underdevelopment.

4. Vegetative lesions, which are divided into the tuberculoma and the osteocartilaginous forms. The tuberculoma, rather rare, is usually found on

the anterior part of the septum. It varies in size and shape, is rose gray or red, granular and of soft consistency. Microscopically, one finds lymphoid elements, giant cells and caseous tubercles. The mucous glands are infiltrated, and the perichondrium may be invaded and perforated. The epithelium of the crypts is cylindrical, while the surface cells may be pavement. The characteristics are those of obstructing tumor. Perforation of the septum is to be expected, but epistaxis is rare. The course is latent, and prognosis is relatively good. The osteocartilaginous form is rare, but serious. It may be primary. The lesion begins in the osteocartilaginous framework of the nose, and gradually invades the mucosa. The symptoms are those of obstruction due to tumor. The appearance of the tumor masss is that of polypoid degeneration. The septum is usually thickened and ulcerated. Progress is rapid, and death often results from tuberculous meningitis.

5. Lupus, which shows a preference for young adults, especially women. It usually attacks the anterior third of the fossa, later invades the choana and finally the pharynx. The lesions are in the form of small tubercles scattered throughout the mucosa. They may be exuberant and assume the vegetative form. On section the usual pathologic condition in tuberculosis is found. The subjective symptoms are not distressing, usually being due to crusting. On insepction one finds eczema of the vestibule. On clearing away the crusts in the nose areas of small rose and brown granulation are found, giving the mucosa a more or less fungoid appearance. In this fleshy bed, ulcerations and even perforations may be found. Sometimes the granulations may be exuberant, and may assume the appearance of the vegetative type. The lesions resolve themselves into cicatrices and deformities. Syphilis may modify the symptoms, the lesions assuming the characteristics first of one condition and then of the other. Cutaneous lupus usually is found.

The usual treatment, general and local, is reviewed. ROTH, Kankakee.

INTRACRANIAL COMPLICATIONS COMBINED WITH OTOGENOUS SINUS THROMBOSIS DURING THE LAST TEN YEARS. TIBOR GERMÁN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **16**:580 (Nov. 8) 1926.

The fact that patients wait for days or weeks before seeking expert advice for this condition is the cause of the high mortality. In the St. Rochus hospital in Budapest, during the last ten years, a cure was obtained in 65 per cent of the acute cases and in 38.9 per cent of the chronic cases. The operative method of choice is the ligation of the internal jugular vein and exposure of the sinus transversus until the healthy portion is reached. A hard tampon is

Cases of Sinus Thrombosis

	Cases	Per Cent
Cases without intracranial complications	27	35
Cases with intracranial complications	50	65
Only perisinous or extradural abscess	27	54
Only intrameningeal or subdural abscess	—	—
Only meningitis	—	—
Only abscess of the brain	3	6
Extradural abscess, subdural abscess	1	2
Extradural abscess, subdural cerebellar abscess	1	2
Extradural abscess, brain abscess	7	14
Extradural abscess, meningitis	4	8
Extradural abscess, abscess of the brain, meningitis	2	4
Subdural abscess, meningitis	1	2
Abscess of the brain, meningitis	4	8

placed between the bone and the sinus. The diseased sinus is laid bare and evacuated, and the lateral wall of the sinus is removed radically. The most frequent complications are: (1) perisinous respectively extradural abscess, (2) intermeningeal and subdural abscess, (3) leptomeningitis and (4) abscess of the brain.

Seventy-seven cases of sinus thrombosis with a demonstrable thrombus in the sinus were observed during the last ten years (1916-1925). Other cases are not mentioned. Germán considers in his essay only cases in which one or more intracranial complications existed besides the sinus thrombosis.

Of the seventy-seven patients, 27 or 35 per cent, did not show any intracranial complications. An extradural abscess was the only complication in 27, or 54 per cent, of the remaining fifty, or 65 per cent, of the series. These are not described. Only the histories and course of disease in the remaining twenty-three cases are given. A thorough critical review follows, which deals with the various complications, their development and their pathology. This must be read in the original. Incidentally, Germán mentions an extradural abscess following a cholesteatoma. The patient exhibited photophobia as the most pronounced sensory symptom. He was reluctant to open his eyes for weeks. Other symptoms of meningitis were absent. The patient recovered.

AMBERG, Detroit.

Miscellaneous

SOME CONSIDERATIONS OF LOCAL AND REGIONAL ANESTHESIA. GEORGES CANUYT, Arch. internat. de laryngol. otol. rhinol. **6**:5 (Jan.) 1927.

The author believes that many deaths resulting from general anesthesia are not reported, and that in comparison deaths from local anesthesia are exceptional. He reviewed the report by a committee of the American Medical Association and that of the Section on Laryngology, Otology and Rhinology of the American Medical Association, and reached the conclusion that there may be idiosyncrasies or that the concentration was too great for the amount used. While deaths reported were less frequent in the Scandinavian literature, about the same condition prevailed.

More accidents were reported from cocaine than from procaine hydrochloride or like preparations. The pharmacist might be held accountable for some deaths, as a few operators could not be absolutely certain as to the concentrations that were employed.

Relatively few reports of accidents from local anesthesia were found in the French literature, although the author admits that many of the deaths resulting from the drug may not have been reported. It is customary in France to use different colored solutions for the different concentrations.

The employment of a local anesthesia before a general narcosis is dangerous, as is the use of epinephrine hydrochloride during complete anesthesia. The position of the patient during local anesthesia may be a factor in the intoxication. The dorsal decubitus or the semireclining position seemed to give better results in the cases reported in the proceedings of the Section on Laryngology, Otology and Rhinology.

In operations on the nose and throat local anesthesia is preferable on account of the absence of bronchopulmonary complications. The author can see no reason for the employment of general anesthesia in operations on the nose and throat except in children and in nervous patients.

In the discussion of this paper three cases of intoxication were reported: one by Beynes, of Limoges, and two by Lamothe, also of Limoges.

SPONTANEOUS RUPTURE OF A LATENT ABSCESS OF THE BRAIN. G. COULET, Arch. internat. de laryngol. otol. rhinol. **6**:38 (Jan.) 1927.

Two and a half years following a radical mastoidectomy in which a considerable area of the dura was exposed, the patient suddenly became semicomatose. Examination of the old operated field showed a rose-colored mass obstructing the canal. Puncture revealed gray pus of fetid odor followed by clear cerebrospinal fluid. Exploration showed a superficial abscess in the substance of the brain, which had spontaneously ruptured into the meningeal spaces.

The author believes that a circumscribed meningitis may have existed at the time of the radical operation, which remained unrecognized and later invaded the cerebral tissues insidiously without giving any symptoms.

OTORHINOLARYNGOLOGY IN INFANCY. DOUGLAS GUTHRIE, Arch. internat. de laryngol. otol. rhinol. **6**:129, 1927.

Three conferences were held at Paris during the clinic of the otorhinolaryngological and facial plastic surgeons. At the first conference the ear of the infant was considered. The usual anatomy was reviewed. Sections were shown demonstrating pneumatization of the mastoid fairly well instituted at the age of 2 years and well advanced at 6. Fifteen per cent of mastoids do not pneumatize, the bone remaining thickened; in case of suppuration intracranial complications are increased.

Otitis media in children under 2 years of age is of extreme frequency and importance. Much of the deafness of adult life may be traced to suppuration at this early age. Certain authorities believe that this early suppuration is the true cause of otosclerosis and nonpneumatization of the mastoid. Examination of a section of the ear at birth shows that the middle ear is filled with embryonic material, which may persist for some time and which may be subject to infection. Autopsies at Edinburgh showed that 80 per cent of nurslings had pus in the middle ear. Examination of the middle ear should be included in the physical examination of the infant—a procedure too often neglected. Many of the latent infections of infancy disappear spontaneously without being detected. Mastoiditis is a frequent complication of otitis, but usually responds to drainage. Seventy-eight per cent of suppurations of the middle ear and mastoid either cease spontaneously or are cured by operation. Ten per cent become chronic, and 7 per cent of the patients die of other causes. Of the chronic cases, 37 per cent are cured by conservative measures. Simple mastoid drainage gives good results in a large majority of instances; radical methods should be used as a last resort and are contraindicated in tuberculosis.

In the second conference the nose of infancy was the topic of discussion. The usual anatomy was reviewed, particularly the development of the sinuses. Special attention was called to the rounded contour of the infant's choana in comparison to the oval orifice of the adult. The choana becomes definitely oval at the age of 2 years, and at the age of 12 assumes the contour of the adult nose. The author believes that this shape of the infant's choana has much to do with the nasal obstruction that is so often found. The ethmoids are present at birth and are subject to infection. What was formerly considered a maxillary sinusitis in infancy is in reality an osteomyelitis of the superior maxilla caused by an infection of a dental bulb. Profuse discharge from the nose in early life may be due to foreign bodies, nasal diphtheria, sinus infection or syphilis. Dental, peridental and dentigenous cysts may be

found. Deflection of the nasal septum may be found in the child, but its correction is usually difficult and not always satisfactory. Polyps are usually solitary and of maxillary origin.

The pharynx and larynx were considered in the third conference. Among the functions of the tonsils that were considered was that they may be hematopoietic organs, and also that they may be the source of a vaccine manufactured in the crypts. The indications for the removal were many and varied. Retropharyngeal abscesses may be due to tuberculosis of the cervical vertebrae or to an infection of the retropharyngeal ganglions. The latter are located in the prevertebral aponeurosis. On account of the higher location of the larynx in infancy, these abscesses cause more difficulty in respiration than at a later age. Of the many congenital malformations of the larynx, the most common is the laryngeal stridor. This is functional, and usually disappears at the end of the second year. Spasm of the glottis is more frequently noted in children over 2 years of age. False croup may be observed. Papillomas, often multiple, are observed in early life. They may be removed by the direct method, but may recur.

Postoperative Escape of Cerebrospinal Fluid. J. Despons, Rev. de Laryngol., Jan. 31, 1927, p. 58.

The frontal meninges may be uncovered necessarily or accidentally in operations on the nasal accessory sinuses. The exposure may not be without consequence, but it is not always fatal. However, the temperocerebellar meninges are more tolerant to exposure and cause less apprehension, which is fortunate because of the many complications which arise in this region. Sometimes the complications, particularly in the region of the ear, are anatomic and at other times pathologic. Many times the pathologic condition masks the anatomic features.

Some authorities believe that exposure of the dura is an indication to puncture the subarachnoid spaces to determine the condition of the fluid as a means of prognosis. The author cites a case of normal cerebrospinal fluid immediately preceding mastoidectomy, in which frank pus was encountered in the arachnoid spaces. He believes that it would be a good procedure in cases of suppuration in the meninges to treat the arachnoid directly, if possible, instead of by lumbar puncture. Direct puncture of the subarachnoid should prove of more diagnostic value than lumbar puncture in mastoidectomy, in which large areas are exposed.

Five cases of postoperative escape of cerebrospinal fluid with recovery in all cases are reported. One operation on an epidural abscess had to be discontinued for three days because of extensive escape of fluid. The author did not note any meningeal disturbances or general manifestations of intracranial hypotension, which are often observed following a lumbar puncture.

Roth, Kankakee.

A Rare Disturbance After Lumbar Puncture. Fleischmann, Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:298 (Nov.) 1926.

A patient, a physician, had had antrotomy performed because of a stormy mastoiditis. Because of recurring symptoms on every effort to get out of bed, a lumbar puncture was made five weeks later, between the third and fourth lumbar vertebrae, 5 cc. of bloody fluid being withdrawn. Thirty-six hours later, there were vertigo and vomiting, which lasted two days, with rapid failure

of strength, so that the situation appeared unfavorable. Following enema with expulsion of considerable feces and gas, there was prompt disappearance of all symptoms. Was it a paralytic ileus without tympanites or a hysterical ileus? There had been no previous abdominal disturbance, and the patient had had a carefully selected diet; there had been no suggestion which led to psychic disturbance of the abdomen. The author believed that some organic connection must have existed between the lumbar puncture and ileus. He cites cases of ileus in which the patients are said to have been cured by lumbar anesthesia. This treatment was based on Pflueger's experimental production of ileus by splanchnic irritation. The author cites a case that came to autopsy, in which blood appeared throughout the spinal canal and in the ventricles following a lumbar puncture, although there was no disease of the blood vessels, and the only injury was a small puncture of a spinal vessel. He thinks that his patient may have had the same condition in a lesser degree.

LEWY, Chicago.

PLASTIC OPERATION FOR TRACHEOSTOMA EMPLOYING MUSCLE. SEIFFERT, Ztschr. f. Hals-, Nasen- u. Ohrenh. **15**:314 (Nov.) 1927.

Two horizontal incisions are made, one over the upper part of the sternum and one a few centimeters above the tracheotomy opening. Through these a part of the sternomastoid muscle on each side is split off; the pieces of muscle are crossed in a subcutaneous tunnel around the opening in the trachea and sutured to the opposite side over the sternum. Tension of the sternomastoid muscles closes the opening voluntarily; otherwise it is sufficient for breathing, but such exercises are not allowed for four weeks after operation, during which time the tube is worn in the trachea. This plastic gives the patient power to close the opening for speaking or coughing without use of the hand. The author suggests also sewing on the omohyoid, which contracts during deep inspiration for voluntary widening of the opening, and thinks that with other slight improvements he may permit patients to dispense with prolonged wearing of tubes in the trachea.

LEWY, Chicago.

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Regular Monthly Meeting, Jan. 3, 1927

ARTHUR M. CORWIN, M.D., *President, in the Chair*

WAX MOLDS OF POSTNARES OPENINGS. Presented by DR. AUSTIN A. HAYDEN.

Dr. Hayden made a preliminary report on the use of wax molds for determining the size and shape of the postnares openings, and presented a boy, aged 14, who had been operated on twice for the correction of mouth breathing. The tonsils and adenoids had been removed. The turbinates did not cause obstruction at any point, but there was complete obstruction of the right anterior nasal opening, due to traumatic deflection of the septum. The boy had been referred to Dr. Hayden for correction of this defect. Some tonsillar tissue had reformed, and when the patient was anesthetized for its removal it was discovered that he had small postnasal choanal openings. Dr. Hayden believed that many of these cases are missed during the usual examination made digitally or by a mirror. Subsequently, he made casts of these openings, using the ordinary Durch composition of dental wax which becomes soft and pliable in water at 140 F., and verified the former observations, for the openings were small pockets, or "bottle-neck" openings. When the molding compound is removed from water at 140 F., it can readily be held in the mouth without any disagreeable sensation of heat.

The molds were made by heating the wax. A piece of tongue depressor was cut to form an angle and a string was attached to it. Rubber tubes were placed in the nose and the soft palate was pulled forward. With the mouth gag in place and the tongue held down with one tongue depressor, the wax was placed on another tongue depressor and pushed back into the nasopharynx and held there for two or three minutes. The wax hardens easily, and if too much is not used the molds can be readily removed.

Molds from another child of about the same age and one from an adult showed large posterior choanal openings and large grooves on the sides for the inferior turbinates.

Dr. Hayden believed these molds would give a relative idea of the size of the interior of the nose and the openings behind and in front.

DISCUSSION

DR. JOSEPH C. BECK: The dental compound is a dangerous material to use because it becomes brittle, and small particles may get into the respiratory tract if the patient is in a sitting position. I suppose that in making such a cast, the head would be allowed to hang over the edge of the table so that nothing of this sort could happen.

Similar work has been done with various materials that have been poured into the postnasal space for the diagnosis of deformities, particularly in the work done by Dr. Casselberry many years ago.

Dr. George W. Boot: In a conversation with Dr. Hayden, I received the impression that he thought the septum was of uniform thickness, but I have always found it somewhat thicker toward the back.

Dr. Albert H. Andrews: When one experiments with dental compound at body temperature one finds that it is not brittle until it becomes cold. By making this experiment the difference between the air capacity of the anterior and the posterior nares can be determined: Dilate the anterior nares; if the patient breathes better, the constriction is probably in front; if no improvement is noted, the constriction is probably farther back.

Dr. Holinger: There are great variations in the width of the choanae, and in removing adenoids it is my habit to examine the choanae carefully and give my assistants a chance to feel them. I believe that narrow choanae are not the exception, but rather the rule. The molds of Dr. Hayden are instructive in many ways. There is no method that gives as clear an insight into the form of the nasopharynx and the relations of the posterior ethmoid and sphenoid cavities and their openings to each other, the choanae and the eustachian tubes, as do the casts. I hope that Dr. Hayden will continue this work.

Dr. Hayden: I wish to confirm what Dr. Andrews has said about the material not being brittle except when it becomes cold. The cooling process takes several minutes.

Dr. Stein has asked how one can tell that the choana is completely filled with the wax. There is no way of determining this until the casts are removed.

At first I experienced some difficulty in using the tongue depressor, but later I had a depressor made with a square end, with a small groove undercut in the end so that a small amount of wax could be molded under this; it is not necessary to use the string formerly employed. It is impossible to make an absolute mold of the choana without encroaching more or less on the nasal passages in front. The thing of most importance is that one can, by this method, prognosticate unfavorably before the operation, if necessary, instead of having the patients and their families discover afterward that the operation has not supplied the full relief sought.

Report on Ephedrine. Presented by Dr. George F. Fiske.

At present a number of able men are engaged in research work on ephedrine and before long we shall doubtless have a fund of knowledge accessible. It is in no sense by way of anticipation that I speak. It is rather to bring forward a few practical suggestions which may help some who are beginning to use the drug.

As to the natural and synthetic ephedrine, that which I have received from Dr. Read in Peking has been the hydrochloride of ephedrine, and this has invariably been active. The different shipments have shown no variation in activity. They have all been natural; derived from the plant *Ephedra vulgaris*. I received a quantity of the synthetic ephedrine chloride from the other side of the Atlantic which I found inactive in comparison with that which came from China. My knowledge of chemistry is too limited to enable me to give a clear reason why the synthetic is not as active as the natural. Of course, it may be that after a time the synthetic will be just as good and probably much lower in price.

As far as I can judge, the activity of ephedrine hydrochloride seems to depend on the fact that it is levorotatory to light; or to put it in another way,

the Chinese ephedrine is distinctly levorotatory and the synthetic which I tested was partly levorotatory and partly dextrorotatory. One chemist tells me that great care has been taken to remove the dextrorotatory quality without marked success to date; when that succeeds, we shall have low priced ephedrine. I have found a similar difference between the natural and the synthetic epinephrine.

Although I am an ordinary mathematician, I will try to give you some idea of the meaning of levorotatory. When a ray of ordinary light or colored light is sent through a rhomboid of Iceland spar—crystallized carbonate of calcium—the ray is split into two parts, two distinct rays, each of which is said to be plane polarized. Send one of these rays through a Nichol's prism of calcium carbonate and then on to another Nichol's prism which is turned at right angles to the first, and the ray is entirely obstructed by the second prism. Now place a plate of quartz between the two Nichol's prisms, and some of the light will go through the quartz and through the second prism; but by turning the prism, all of the light can be stopped again. This is called circular polarization.

Some organic substances possess the same properties as rock crystal (quartz). For instance, place a tube containing a solution of cane sugar between the two Nichol prisms and the second prism must be turned to the right to stop all the light. With both ephedrine and epinephrine the prism must be turned to the left. With the ephedrine hydrochloride I have here the levorotation is 32 degrees.

As to solubility, the alkaloid ephedrine (Dr. Read sent me a small amount) is insoluble in water and only slightly soluble in the vegetable oils. On the other hand, both the hydrochloride and the sulphate of ephedrine are soluble in water.

Although the solutions are as stable as those of atropia or cocaine, I would suggest that you obtain the hydrochloride crystals and make your solutions fresh from time to time instead of using a solution which may be old. In my last report I spoke of a 2 per cent solution as being the best. I still find it satisfactory, but several are using a 3 per cent solution. Any strength from 2 per cent to 3 per cent in distilled water will shrink the mucous membrane for intranasal operations, and any ordinary strength of cocaine may be used with it.

Ephedrine has been extensively used orally in treating patients who have hay-fever and asthma. It has been given in doses of different strength. All that I can say from my own experience is that four adults who took doses of from one-third to one-half grain three times a day reported great acceleration of heart action and troublesome wakefulness. This might lead us to try doses of one-eighth or one-sixth grain (0.008 or 0.01 Gm.) by mouth and then increase the dose if necessary.

I have not used it hypodermically. Perhaps one of our colleagues can give us some light on this method.

DISCUSSION

DR. BECK: I believe that by this time almost every one has tried ephedrine. Dr. Fiske supplied me with some that he obtained from China, which I have used with great success. Patients have great difficulty in obtaining the proper kind, and the 3 per cent solution of the synthetic compound is not satisfactory. Recently we have been able to secure the real article, and the results have been much improved. I have never used it hypodermically, but a number of internists who have used it in cases of asthma have reported negative results.

DR. ROBERT SONNENSCHEIN: Through the generosity of Dr. Fiske I have used the drug in a limited number of cases, and also on myself. It seemed to have an advantage over epinephrine in that little sneezing follows its use. One disadvantage is that it has a bitter taste, as have all alkaloids. I believe this

can be avoided by using it with applicators instead of with a nasal spray; thus it can be prevented from running down into the pharynx.

I have been told that this drug was used by the Chinese many years before the Christian era. Its use was then discontinued until about the fifteenth century; it was then used, but again allowed to fall into disuse. It was not until the present century that some man in Peking noticed that the drug had a great pressure-raising effect, and thus ephedrine was again brought to the attention of the medical profession.

Dr. Hayden: Recently an asthmatic patient told me that his physician in Indianapolis had recommended the use of ephedrine. He used this in a 2 per cent solution, injecting it with the head thrown back and the body in a recumbent position. I thought that the difference between ephedrine and epinephrine was about a ratio of 2:8, patients experiencing relief for eight hours after the administration of ephedrine and for only two hours after epinephrine.

Dr. Otto Stein: I recommend the use of ephedrine strongly in the place of epinephrine in almost all cases in which epinephrine is usually employed. I believe it is almost invariably satisfactory for topical applications in the nose. One precaution should be observed: One must be sure that the hydrochloride is being used. After prescribing it several times I found that my patients had great difficulty in securing it, and the results were not nearly so satisfactory when they obtained the sulphate, which is the only kind made by American firms that has been on the market for some time. It is now possible to secure this, and I am sure the results will be satisfactory.

Dr. Fiske: Dr. Read has sent me a supply, and as long as I can secure it I will be glad to share it with you. I have been informed that the Abbott Company will have it a little later. The Lilly preparation is in the form of a solution.

Further Details Regarding Tar Cancer. Presented by Dr. Boot.

The mice that Dr. Boot had presented at the previous meeting had all died, and examination showed that two had developed metastatic cancer in the lungs.

He presented a rabbit that had developed epithelioma on both ears. The peculiarity and importance of the experiment was that the rabbit's ears had been painted twice a week for six weeks about a year ago. For six months there was no apparent change, but within the last few months the rabbit had developed enormous hyperkeratoses of the epithelium. Sections from the growth had been examined, and revealed nests of epithelial cells with marked cornification.

Cartilage and Bone in Nasal Plastic Surgery. Presented by Dr. Samuel Salinger.

The advantages of costal cartilage for restoring the contour of the nose are as follows: 1. It is readily obtainable in sufficient amounts from the right seventh to the tenth ribs without danger of impairing the integrity of the wall of the chest. 2. It is easily cut and shaped. 3. It possesses remarkable resistance to infection. 4. It may become thoroughly incorporated into the surrounding tissues, retaining its vitality and deriving sustenance from its host.

The disadvantages are: 1. Instead of remaining viable, it may become absorbed or replaced by fibrous tissue. 2. The incidental operation necessary to obtain the implant implies some slight risk of infection and a scar on the chest.

The advantages of ivory over cartilage are: 1. It is tolerated by the tissues with but slight reaction. 2. The insertion of the implant is a simple procedure

from the patient's point of view, requiring little operation. 3. The implant is not affected by the host, and chances of extrusion through infection are minimized.

The usual procedure is to cut and shape the ivory to fit a plaster or wax model of the patient's nose. It is then polished with sandpaper and perforated with small holes to lighten it and also possibly to serve for the growth of fibrous trabeculae from surrounding tissues. It is inserted through a median columnar incision. There is less danger of extrusion than when the intranasal method is employed, because this usually occurs through pressure on a mucous surface, which is less resistant than skin. Therefore, the farther away from the mucous membrane one places the ivory, the less is the danger of erosion and extrusion. For a depressed tip two pieces of ivory are employed to make a columnar prop, the upper end of which is cut peg-shaped to fit into a hole drilled in the lower end of the dorsal piece. They should fit loosely in order to allow for the average mobility about the tip of the nose.

DISCUSSION

DR. BECK: One of the greatest disadvantages of such work is the application of many persons with slight defects who wish to have them corrected for purely cosmetic reasons. It is legitimate work for professional men to do in order to overcome the work of incompetent operators. It is profitable work, but one experiences great difficulty in pleasing the patients and keeping them pleased.

I believe ivory is the most satisfactory material for the implants, although one is taught never to use a foreign body in the nose, where there is such close proximity to infective organisms. The make-up of ivory is such that it is well borne by the tissues, but many of the implants do eventually come out. Celluloid was once thought to be ideal, but finally every implant was extruded. Dr. Pollock and I have done such operations with satisfactory immediate results, but more than 75 per cent of the implants have extruded in spite of the greatest care. Most of the implants were placed intranasally and not through the columella. I believe this is as good a route as that through the columella, but the transudate of leukocytic substances and serum that will finally form a substance analogous to an abscess eventually forces the implant out in the majority of cases. Some personal element might have to be considered. For the occasional operator it is more of an operation than it seems. I have the same trepidation regarding ivory that I formerly had regarding paraffin, although I believe it offers the best results at present.

The shaping of the implant is important, and this can be done well before the operation. Dr. Salinger's method is much better than that of Joseph, but cartilage appeals to many persons in preference to the seeming foreign body. The cartilage is nourished by contiguity of tissue, but when in the loose tissue it is likely to be attacked by the formation of trabeculae, and a certain amount may be absorbed.

Why has Dr. Salinger not referred to the use of the roentgen-ray as a control in showing whether or not the cartilage is in place or has become calcified? The viability or longevity of the cartilage can be demonstrated in this way.

Care is necessary in securing hemostasis before the implants are placed, because a dry field is necessary. If blood is permitted to remain in the space, the implant cannot find a good resting place, and failure will result. A transplant can be made over if it is of ivory, the same as with cartilage, as has been proved on several occasions. In some cases in which bleeding occurs in spite of great care, it is better to pack with gauze and leave it in until the following day.

With the work in the hands of such men as Dr. Salinger it is sure to prove useful. In order to have the patient satisfied with the results of operation, I have a model made of the face before operation, including the eyes and upper lip, I show this to the patient before attempting any correction of defects. In the case of a slight blemish such a model will often convince a patient that the defect is not as great as he had thought, and he is satisfied not to have an operation; or, if an operation is performed, he will have the model for comparison with the results obtained.

In correcting a hump nose, one should avoid cutting off too much, for there is always a reaction.

Dr. B. F. Andrews: I have done some of this plastic work. My first patient was a young girl who consulted me about the time the paraffin injection method came out. I built up the saddle nose by this means and obtained a fairly satisfactory result, but after two years the young lady returned because the paraffin had slipped to one side. I removed it as well as possible, and found a deflection of the septum. I lifted the cartilage and took out the deflection and put it back into the cavity made by the cartilage. This grew well, and the patient's nose now has a good appearance.

In other cases I have used cartilage from the septum, but I prefer to use a portion of the bone from the septum in addition to the cartilage, as I have found that this lasts better and is more satisfactory.

To prepare the patient's mind for operation and to prevent further trouble, I never tell him that I am operating to improve the appearance. If there is some obstruction to breathing or something of that sort, I tell the patient that the operation is done for the relief of that difficulty. If, in addition, the appearance is improved, he is pleased.

Dr. Boot: It is important to get the transplant underneath the periosteum. I have operated in one case in which this was not done, and the implant was movable. I had to remove it and place it under the periosteum before it would stay in place.

Dr. Salinger: My experience is the same as Dr. Beck's, in regard to the implantation of septal cartilage — septal cartilage does not survive. I have tried it in three cases, and in each instance extrusion occurred. I agree that hemostasis is important, for the cavity into which the implant is placed must be dry. Following any implantation, it is necessary to apply some sort of compress in order to keep the implant in contact with the tissues. If this is not done, there will be slow bleeding and the formation of a hematoma, with infection.

I agree with Dr. Beck concerning patients who seek relief for cosmetic defects. In many instances they are not satisfied with the result. In one case I had to remove the implant twice and reshape it, and still the patient came back to have it changed again.

Another important thing is the prognosis; the slighter the blemish, the less satisfactory is the result to the patient; the more noticeable the defect, the better the result from the patients' point of view. Most patients should be discouraged about having slight defects corrected.

Tinnitus Aurium — Some Considerations of Its Causes. Presented by Dr. Williams.

A large percentage of the patients referred to specialists in otology present tinnitus either as an isolated symptom or in conjunction with others. Not infrequently a lesion in the auditory apparatus capable of explaining the symptoms is not found. Many people grow increasingly deaf for years without realizing

the extent of their infirmity and are finally driven to consult the otologist only by the importunities of their friends; but the victim of tinnitus needs no urging. He appeals for assistance early because the nature of his malady is such as to make life almost an intolerable burden, and even to render him fearful regarding his sanity.

Tinnitus is not a disease, per se, nor is it a definite symptom of some aural conditions which the presence of tinnitus enables us to recognize. Its exact pathology is far from definitely understood. However, we are accustomed to associate all subjective ear sounds with some disordered condition of the eighth nerve.

G. W. McKenzie tells us that theoretically every attack of eighth nerve neuritis should present this symptom, but in practice symptoms often mask it to a considerable extent, and A. W. McKenzie reports two cases in which tinnitus continued in spite of complete deafness, until absolute destruction or degeneration of the nerve had taken place. He does not give us any light on whether the relation between tinnitus and eighth nerve neuritis is an organic or a functional lesion. A careful consideration of the subject will, however, force us to the conclusion that many factors enter into the causation of this baffling condition.

Most of our cases of tinnitus can be divided into two general classes: first, those in which tinnitus is present without noticeable diminution of hearing, possibly due to disturbance of the function of the auditory nerve centers of the labyrinth perhaps caused by some abnormal state of the circulation; second, cases presenting marked deafness caused by a definite pathologic condition in either the external, middle or inner ear.

Dan McKenzie classifies tinnitus as simple or compound, the simple tinnitus being represented by the subjective sound that is uniform in character, however variable it may be in quality or loudness. Compound tinnitus consists of subjective sounds which vary not only in loudness, but also in character, several distinct noises being simultaneously audible.

The character of these sounds is variously described by sufferers seeking relief, the patients generally drawing their similitudes from the subjects and noises of their environment. Rural people classify them as the singing of birds, the buzzing of bees or the sound of the wind blowing or rustling through the trees, while urban patients tend to classify their sounds in accordance with their ideas of steam escaping from radiators, the rolling of carriages, hammering and the various noises caused by motors and steam engines.

Dan McKenzie states that compound tinnitus is found in the more serious and obstinate forms of middle ear deafness, often preceding cochlear involvement. He has noted it in otosclerosis and in such general diseases as arterial sclerosis, chronic interstitial nephritis and high blood pressure.

In everyday practice it is commonly the simple form that we encounter. This form of tinnitus may easily occur in a person who exhibits no apparent organic diseases. Finding such great difficulty in determining the cause of this annoying symptom through the usual channels of aural investigation, I began to search the literature for analogies involving other sensory nerves which might give us a clue to a better understanding of the condition. To do this required consideration of the physiology and pathology of nerve centers governing other special senses and to seek what might be an analogous condition associated with the abnormalities of these centers in patients presenting such disorders. Exhaustive studies have been carried on to determine alterations which take place in the cortical centers after the enucleation of the eyeballs. I have inquired of some

blind patients whether or not they felt that they had any "sense of sight perception" after the eye was removed, as a person whose legs have been amputated projects a pain or other sensation into his toes. Immediately I was confronted with the problem of properly differentiating the responses of these patients. It does seem, however, that there is a vague sense of sight in some of these blind eyes. This is manifested by a feeling that some patients have that they see a dark gray or even a colored pattern, which they attempt to describe, projected before either one or both of the enucleated eyes. It is difficult to determine whether they actually "see" these conditions, though they may describe them as distinctly as the tinnitic patient describes his subjective sounds, or whether it has now become a visual hallucination, the patient thinking that he sees them. I have had a totally blind patient say that he seemed to "see in his field of vision" a boy on a bicycle that was constantly pedaling and yet never moved out of the range of his "visual field." It is obvious that it becomes exceedingly difficult to differentiate visual hallucinations from actual visual pathway irritation.

We certainly are not justified in classifying tinnitus as an hallucination, except in cases of well marked mental disturbances indicated by symptoms other than the fact that the patient hears noises; but is it unreasonable to suppose that in cases of tinnitus with complete deafness we have a certain amount of intellectualizing as suggested by Schule? A survey of the literature leads to the conclusion that the persistence of subjective vision following the destruction of the optic nerve can hardly be compared to the persistence of tinnitus when there is every reason to believe that all possibility of hearing is gone. While we are unable to find any definitely detailed report of patients who sometimes sense visual objects in spite of destroyed optic nerves, we all know that cases of persistent tinnitus regardless of whether or not there is hearing is a common occurrence.

Unfortunately, much the same situation prevails when the other special senses are investigated. Greenwood states that the senses of taste and smell have many points of resemblance, one of them being the scantiness of the knowledge regarding the physiology of either. In fact, we are unable to learn whether the gustatory cells are really end-organs, such as the retinal cones or rods, or whether they merely act as props on which the nerve ends twine. Likewise, we have no knowledge as to the cortical representation of taste, although there is some trifling evidence that the anterior sylvian convolution might possible be its location. The cortical representation of smell is also doubtful, and the connections of the olfactory tract are numerous and complicated, while experimental work on lower animals is beset with numerous obstacles. Some of these animal experiments almost lead us to believe that smell, at any rate, does not depend on the olfactory nerve. Magendus' experiment in which the olfactory nerves in a dog were destroyed as far as the lamina cribrosa, indicated that the dog, immediately on recovering from the operation, was presented with several paper parcels of the same size, some containing cheese and others wood. The dog, without hesitation, selected and unwrapped the packages of cheese.

We have all had patients who complained of a "metallic taste" when metal could not be a factor, the so-called "dark brown taste" of the alcoholic and numerous other apparent perversions of taste. However, we assume that there are physiologic, if not pathologic, explanations of these tastes, owing to the efforts of the system to throw off alcohol in the latter, whereas the patient with a metallic taste may have constipation or some other disturbances of the gastrointestinal tract accountable for the metallic-like taste. However, it is possible

that the metallic taste, or some of the other tastes less frequently defined, may be due to the same cause as tinnitus, though, of course, we have no means of proving this.

We have taken up the consideration of cutaneous reactions only to find that here there is no analogy between tinnitus and such conditions as cutaneous irritations, except possibly in such conditions as formication — that feeling of insects such as ants persistently running over certain areas of the skin. I had one case of this that persisted for years in spite of every conceivable treatment. It involved the supra-orbital branch of the right side. The patient was active and well known, and the feeling annoyed him to such an extent that he almost had to give up his business. The symptom was entirely subjective, as there was absolutely no indication from the appearance of the skin that there was any pathologic condition; although as the patient is still living, it is impossible to state that there might not be actual neuritis or some other pathologic condition in this division of the fifth nerve. At any rate, the evidence is sufficient to suggest an analogy here, but certainly a suggestion is the most that can be obtained, as in this case, too, there is no definite knowledge.

Consequently, after reviewing all of these subjects, I have not developed much constructive information. Generally speaking, I feel that there are definite though perhaps meager analogies, but we cannot make absolute deductions from them. We feel that there is an analogy between the so-called "seeing stars" and "hearing a big rush of noise" as frequently described by patients subjected to head trauma. We might note here, too, that it is easier to believe drug tinnitus as associated with quinine and other drugs, affects the center of hearing rather than the nerve tract, when we bear in mind that in quinine amblyopia the fundi may appear absolutely normal. In spite of these investigations, I feel more or less discouraged in finding definite data on which to base conclusive results. While tinnitus may be due to one cause, it most probably has multiple causes, eventuating in this one annoying symptom, which is so often accompanied by diminished hearing.

THREE CASES OF LATERAL SINUS THROMBOSIS. Presented by DR. HERBERT B. WOODARD.

Wilmer H., a boy, aged 8, of frail physique, entered the hospital on June 9, 1924. In March, 1927, a rash appeared, followed by some peeling, but which was not considered scarlet fever. The preceding summer he had fallen on the pavement, striking the back of his head. There was no loss of consciousness, but nausea and vomiting followed with a rather persistent headache lasting for weeks. About ten days before his entrance into the hospital he was politzerized for a catarrhal deafness of two weeks' duration. The following day he had pain in the right ear and a paracentesis was done the same day by the physician, with relief. The next day the left ear became painful and was opened. He apparently was comfortable until the day he entered the hospital, when his temperature rose to 104 F. Both ears were discharging moderately, with no tenderness over either mastoid. The roentgen-ray report follows: "Little departure from normal in either mastoid, but cells in left were cloudier and septums of those close to antrum were partly obliterated." The blood count was 29,000 on admission. Both drum membranes were incised on June 12, to induce better drainage. For five days following admission, the temperature ranged from normal to 103.5 F. during each twenty-four hours was a slight chill preceding the high temperature and perspiration following. Blood cultures taken on June 13 and 23 were negative. Operation was performed on the left mastoid on June 15, at which time both

middle ears were discharging; tenderness could not be elicited over either mastoid. The cells were only moderately involved, and there was little free pus or necrotic tissue. Diseased bone was removed from over the lateral sinus, and its wall was rough and thick and dull red. The internal jugular vein was exposed and severed between two ligatures. The sinus was then incised between tampons and found to bleed from the torcular end only. The temperature abated for two days, but on the third day it went up to 104 F. and on the two following days reached 105.5 F. accompanied by chills. The blood count at this time was 20,000. A combination of iron citrate and arsenic was used intravenously. Methenamine was given to the point of tolerance. Eleven days after the operation the temperature again reached 105 F., with chills. For two weeks the patient had had some pain and tenderness in the left leg medially to the tibia, which now developed into an abscess and was incised on June 30. A chill and temperature of 103 F. plus on July 3 was the last appearance of a high temperature. The white cell count at this time was 25,000 and the red cell count, 3,000,000. From July 8 on, the temperature was normal or subnormal, and he left the hospital on July 14 with both ears dry, mastoid and leg wounds healed and hearing about normal. The neck wound healed without suppuration.

Carl H., aged 6, developed a mild case of scarlet fever, undiagnosed, on Nov. 23, 1924. The patient was about the house during the time, and later, the skin peeled freely. On December 19, pain began in the left ear, the membrane of which was opened the following day. The discharge was free and blood tinged, and pain was only partly relieved. On January 3, the tissues behind the ear were swollen and the auricle was prominent, remaining in this condition until the patient's entrance into the hospital on January 15. The white cell count was 19,000 and the red cell count 3,700,000. At this time, examination of the throat showed large tonsils without inflammation and a moderate enlargement of adenoid tissue. A reddened fluctuating swelling was present behind the left ear with the auricle standing out from the head. A fair amount of discharge was coming from the middle ear. He was operated on the same day through a Whiting incision, and pus was found outside the periosteum. A fistula led to the antrum, and practically all of the mastoid cells contained pus and granulation tissue, with septums largely broken down. A large tip cell was also infected. A large mass of granulation tissue covered the lateral sinus, and this was not disturbed. The wound was packed as usual, and no sutures were taken. The ear drum was incised and narrow gauze drainage left in the canal. Culture taken during operation showed *Streptococcus nonhemolyticus*. Temperature at the time of operation was 103.1 F. Two days later, the temperature ranged from 102 to 104.5 F., with nervous twitching and some cold sensations. Two days later, the temperature ranged from 97 to 104 F. in six hours, with considerable sweating but no marked chills. On January 20, five days after the operation, the internal jugular vein was cut between two ligatures, the packing removed from the mastoid wound and the sinus examined. The mass over the sinus was incised for a distance of 1 inch (2.5 cm.) between tampons. The tissue was tough and fibrous, and the sinus seemed a part of it to the extent that no free bleeding occurred from either direction when its wall was opened. It was left this way without probing, and iodoform gauze was used. A specimen of this dense tissue involving the sinus was examined by the Chicago Laboratory, and a report was returned characterizing it as a fibroblastoma. For three days after the operation the temperature ran a sharp course, ranging each day from 98 to 105 F. From this time on it gradually improved,

although ten days later it reached 103.5 F. This was the last high temperature, and the boy left the hospital on February 8, convalescent.

Gertrude B., aged 9, gave a history of an abscess appearing in the left ear two years prior to presentation. For the last ten days she had had a discharge from the left ear, which ruptured without previous pain. During the ten days she felt well, but was kept from school. She had had no sickness for two years, and was apparently a healthy child. Two days before entering the hospital she had a sudden rise in temperature to 104 F. accompanied by chills, but no pain. The next day the temperature went to 105 F. plus, and two or three chills occurred during the day. The patient was first seen when she entered the hospital on June 2, 1924, with a temperature of 105.6 F. and a chill of two hours' duration. She had a tender left mastoid, with some swelling of the tissues over the bone. She was irritable, but bright mentally and did not have pain when quiet. The mastoid was opened the same day, and the cells were found to be extensively involved and filled with necrotic tissue and pus. Culture from the antrum showed streptococci. The lateral sinus was bared for about 1 inch and opened, as it was covered by diseased bone and its wall did not appear normal. Bleeding seemed free from each end, and it was packed without ligating the jugular vein. There was considerable loss of blood from the sinus. She was returned to bed in one and a quarter hours in fair condition, with proctoclysis. In twelve hours she became delirious and remained so for thirty-six hours, but the temperature was not high. The blood count at the time of operation was 10,000 white cells and 3,600,000 red cells. The urine was normal. Two days after the operation she began to have a septic temperature, reaching 105.9 F. and dropping to nearly normal. Chills accompanied the rise in temperature, and there was involuntary urination. Three days after the operation the jugular vein was ligated, as it seemed that a mural thrombus may have existed. A blood culture taken on July 7, contained streptococci and staphylococci. The spinal fluid contained 12 cells to the cubic millimeter, without growth. The temperature gradually grew better, and for eleven days before she left the hospital it had not exceeded 102 F., occasionally she had a normal morning temperature. She went home on July 25 with a white cell count of 20,000 and a red cell count of 3,500,000. She had had two blood transfusions early in July. Iron citrate and arsenic compound were given intravenously over a long period. She slept well during the latter two weeks in the hospital. It was thought that the child would recover, because at home she continued to be wheeled outdoors, and had good nursing. On August 15, she returned to the hospital with an abscess in the right hip, which was opened and drained. The mastoid wound discharged for ten weeks from the time of operation. In October, pus with a large amount of sediment began to show in the urine. As the condition grew worse a diagnosis of suppurative pyelitis or pyelonephritis was made by Dr. Gardiner who was attending her. There was marked tenderness and rigidity in the area over the right kidney. The patient was readmitted to the hospital on November 5 for exploratory incision over the right kidney by Dr. Dyas, but no gross pathologic condition was found. A third transfusion of blood was made at this time. The urine contained 4.75 per cent albumin and a large amount of pus. The red cell count was 2,000,000 and the white cell count 16,400. Gastro-intestinal irritation with much distention, tenderness and pain developed; the incision over the kidney did not close, and the mastoid wound reopened. The patient died early in January, about eight months after the operation.

SECTION ON OTOLOGY AND LARYNGOLOGY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

Feb. 16, 1927

JAMES A. BABBITT, M.D., *Chairman*

OTOGENIC PATHOLOGY IN PARALYSIS OF THE ABDUCENS NERVE. Presented by DR. W. H. SEARS, Huntington, Pa.

The conclusions set forth here are based on the study and analysis of 210 cases of paralysis of the sixth nerve caused by aural suppuration. One hundred and ninety cases were found in the literature since 1910, sixteen are unpublished cases from the records of other otologists, and four are cases which I have observed.

Almost twenty years ago and again three years later, Gradenigo brought forth his now famous syndrome characterized by the symptom triad; suppurative otitis, severe temporoparietal pain and paralysis of the homolateral abducens nerve, subsequent to the diffusion of purulent infection from the tympanic cavity to the apex of the pyramid.

In 81 per cent of cases the suppuration is acute. In most of the cases reported the tympanic membrane perforated spontaneously, or if myringotomy was performed it was done late in the disease. Rarely did the tympanic membrane remain intact.

With paralysis of the aural abducens nerve, pain is almost always present. In 161 cases it was absent three times, in ten it was slight to moderate, and 148 times it was severe. The pain usually was homolateral and was little relieved by narcotics or anodynes. Frequently it persisted for days. Often it was associated with pain in the ear which disappeared after adequate tympanic drainage was established. The most frequent site of pain was the frontotemporoparietal region.

Paralysis of the abducens nerve is frequently sudden and complete, sometimes gradual. The first subjective symptom is homonymous diplopia observed by the patient on looking toward the affected side. This may pass unnoticed in the presence of intense pain. Objective observations are a marked convergent squint and inability to rotate the affected eyeball outward beyond the midline.

It is important to bear in mind the intimate anatomic relation of the gasserian ganglion and the sixth nerve, for a pathologic process influencing one can conceivably involve the other. Direct extension of the tympanic infection may be through peritubal pneumatic cells or perilabyrinthine cells. A pneumatic pyramid is essential. This extension has taken place indirectly through the tegmen, through the floor to the jugular bulb, anteriorly and mesially to the carotid canal and plexus, through the labyrinth and posterior to the antrum and mastoid cells.

In the series of cases studied there were forty-two deaths. Thirty-one were due to meningitis. The slides demonstrate the anatomic features of the temporal bone which influence the occurrence of this symptom complex.

DISCUSSION

DR. GEORGE M. COATES: About twenty-four years ago Gradenigo brought out his symptom complex, the pathology of which was demonstrated by Perkins in 1910. Since then it has been recognized that various ocular paralyses may

be otogenic in origin. Eggleton has found four cases of paralysis of the sixth nerve occurring in cavernous sinus thrombosis. The gravity of this symptom should be impressed on the otologist. Dr. Sears' series shows a 16 per cent mortality. Many patients recover following such simple procedures as myringotomy or operation on the mastoid. Conservative surgical intervention at other times is not enough. The variations of Dorello's canal and the possibility of the nerve being pinched in this canal are most interesting. Recently I saw a patient recover following mastoid operation.

Dr. J. Clarence Keeler: This syndrome most often occurs in late spontaneous perforation or myringotomy. This calls for early intervention. Often the streptococcus is present. Recognition of this condition is becoming more general. In some cases the conditions develop some time after the acute condition of the ear has subsided; in four they occurred as long as four months after operation.

Dr. Temple Fay: It is difficult to explain why an infection of the pyramid selects the sixth nerve adjacent to it, though lying free in the subarachnoid space, and its extension to the fifth nerve at times. However, if we analyze the pain manifested in these cases, it is found that it is not true trigeminal pain and is not confined to the trigeminal field. The pain has much of sympathetic origin, both in the trigeminal and in the adjoining fields, and the painful points seem to follow the arterial distribution.

The explanation, in the light of what Dr. Sears has pointed out regarding the structure and anatomy of this region, would appear to implicate the carotid artery in its passage through and below the involved region, inflammation traveling along the sheath of the carotid, reaching the sixth nerve, which lies adjacent to it in the cavernous sinus and involving the sympathetic fibers given to the gasserian ganglion, as well as the posterior mesial aspect of the ganglion itself.

The slides and cases given illustrate the type of sympathetic pain encountered. Dr. Sears' contribution goes a long way toward explaining certain indefinite pains of sympathetic origin and the possible involvement of the carotid artery in its canal, and is a constructive piece of work.

Dr. Alexander Randall: I have seen a number of cases of bilateral and unilateral paralysis of the sixth nerve. When bilateral they are usually specific. The extreme vulnerability and length of the sixth nerve must be remembered. In a large series of mastoid cases pachymeningitis was found in about two thirds. Since this is so, one would expect involvement of the sixth nerve when the petrous bone is invaded by suppuration.

Dr. Luther Peters: I should like to ask Dr. Sears what per cent of patients recover without operation. In most of the cases I have seen a mastoid operation has been performed some time before. The ophthalmologist does not consider the paralysis alone an indication for surgical intervention, but stresses early operation when the optic nerve shows any sign of involvement. Gradenigo's syndrome may be masked by other conditions.

Dr. Mathew Ershner: I had one case in which palsy of the sixth nerve was relieved following removal of an impacted tooth. In typical cases I have always found a large cellular mastoid. In one case in which the mastoid cavity was filled with bismuth paste the symptom complex appeared.

Dr. Robert J. Hunter: I have seen Gradenigo's syndrome in basilar meningitis, the meningitis being verified at autopsy. In another case it was present in otitic abscess of the brain and disappeared following drainage of

the abscess. Some have mistaken a previously existing strabismus for a recent palsy of the sixth nerve. Bárány maintains that peripheral paralysis of the sixth nerve can be differentiated from central paralysis by caloric and turning tests.

Pain occurs in many cases of facial paralysis, which is probably due to involvement of the geniculate ganglion and the nerve of Wrisberg.

DR. SEARS: I believe that conjugate deviation might arise from meningeal irritation. In the series reported, twenty patients were not operated on, and four of these died.

Book Reviews

CANCER DE L'OESOPHAGE. PAR L. BERARD and A. SARGNON, Lyon, France. Price, 77 francs. Pp. 448, with 76 illustrations. Paris: Gaston Doin, 1926.

This book is one of a notable series of comprehensive monographs on cancer in the different regions of the body, published by The Librairie Doin, under the direction of Prof. H. Hartman and Prof. L. Berard, with the editorship of Dr. A. Chalier. These names are sufficient assurance of the high character of the work, and this volume is fully what might be expected.

The book is doubly welcome because of the well known facts, first, that esophageal cancer is by no means uncommon and, second, that it is associated with the highest mortality known in this dire disease. It is one of the greatest reproaches to modern medical science. Malignancy in this region calls for the closest study, in the hope that something may be done to reduce its mortality rate of 100 per cent.

The subject is considered systematically in seven well arranged sections: Anatomic and Operative Considerations; Physiology; Etiology and Pathogenesis; Pathologic Anatomy; Symptoms, Clinical Types, Complications; Diagnosis; Treatment. A complete bibliography is appended to each section, and the list of authorities quoted stamps the book at once with the international character to which its French language entitles it.

In diagnosis, all means receive due consideration; but in conformity with modern thought, first place is given to the roentgen ray and the esophagoscope. The points of differentiation from all other esophageal diseases are given clearly.

Treatment is presented, as befits so comprehensive a book, from the broadest point of view; all authoritative opinions and conclusions are presented fairly. To this the author adds an expression of his own well considered opinion, based on a large experience. He favors early gastrostomy in most cases, but uses nasal feeding tubes, intubation and rectal feeding for temporary purposes. His personal experience with radium has not been encouraging, but he gives his technic, which seems excellent. He advises preliminary gastrostomy if radium is to be used. He states that the history of radical measures, may be divided into two distinct periods, namely before and after 1913. Prior to that time, all operative efforts had been followed by fatal results. In that year Torek had one patient who was cured, since which, relative cures have been reported by Zaaijer, Kuttner, Hedblom, Lilienthal and Bircher. The technic of the different procedures is given briefly but clearly. It is perhaps unjust to so broad a work to quote particular statements, as all points of view are fairly presented for the reader's consideration. The whole book is so preeminently constructive as to leave no place for criticism.

The publishers are to be praised for good, clear, large type, good halftones on inserts of coated paper, good press work and a serviceable binding in flexible form, which, with the trimmed edges, makes the volume unusually comfortable to handle, and its contents quickly available for reference.

Directory of Ophthalmological and Otolaryngological Societies

NATIONAL

AMERICAN BRONCOSCOPIC SOCIETY

President: Dr. D. Crosby Greene, 23 Bay State Road, Boston, Mass.
Secretary-Treasurer: Dr. Henry B. Orton, 24 Commerce St., Newark, N. J.
Place: Hotel Chelsea, Atlantic City, N. J. Time: May 21, 1927.

AMERICAN LARYNGOLOGICAL ASSOCIATION

President: Dr. Chevalier Jackson, Philadelphia.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Place: Atlantic City, N. J. Time: May 23-25, 1927.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Burt R. Shurley, 62 W. Adams Ave., Detroit.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.
Place: Atlantic City, N. J. Time: May 26-28, 1927.

AMERICAN OPHTHALMOLOGICAL SOCIETY

President: Dr. William Zentmayer, 1506 Spruce St., Philadelphia.
Secretary: Dr. Emory Hill, Professional Bldg., Richmond, Va.
Place: Quebec, Canada. Time: June 27-29, 1927.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Ross Hall Skillern, 1928 Chestnut St., Philadelphia.
Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha, Nebr.
Place: Book-Cadillac Hotel, Detroit. Time: September 12-16, 1927.

LOCAL

SECTION ON OTOLOGY AND LARYNGOLOGY OF THE BALTIMORE CITY MEDICAL SOCIETY

Chairman: Dr. Edward A. Looper, 605 Park Ave., Baltimore.
Secretary: Dr. Edwin N. Broyles, 1100 N. Charles St., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m. last Friday of each month.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Arthur M. Corwin, 25 E. Washington St., Chicago.
Secretary: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Grill Room, Stevens Restaurant, 16 N. Wabash Ave. Time: 6 p. m, first Monday of each month from October to May.

CINCINNATI OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Frederick W. Lamb, Provident Bank Bldg., Cincinnati.
President-Elect: Dr. Walter Murphy, 707 Race St., Cincinnati.
Secretary-Treasurer: Dr. Harris H. Vail, 24 E. 8th St., Cincinnati.
Place: University Club. Time: 6:45 p. m. on second Tuesday of each month from October to May.

THE OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SECTION OF THE CLEVELAND ACADEMY OF MEDICINE

Chairman: Dr. W. J. Abbott, 8314 Euclid Ave., Cleveland.
Secretary: Dr. A. L. Stotter, 1148 Euclid Ave., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

THE COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Dr. David A. Strickler, Empire Bldg., Denver.
Secretary: Dr. C. Howard Darrow, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg. Time: First Saturday of each month from October to May.

THE KANSAS CITY EYE, EAR AND NOSE SOCIETY

President: Dr. Joseph W. Kimberlin, Rialto Bldg., Kansas City, Mo.
Secretary: Dr. A. E. Eubank, 636 Argyle Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May; the November, January and March meetings are devoted to clinical work.

THE SECTION ON LARYNGOLOGY AND RHINOLOGY OF THE NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. John E. Welch, 138 W. 70th St., New York.
Secretary: Dr. Arthur Nilsen, 40 E. 41st St., New York.
Time: 8:30 p. m., on fourth Wednesday of each month from October to May.

THE OTOLOGICAL SECTION OF NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. J. L. Maybaum, 12 E. 86th St., New York.
Secretary: Dr. R. T. Atkins, 4 W. 53d St., New York.
Place: 103d St. and Fifth Ave. Time: Second Friday of each month from October to May.

THE SECTION ON OTOLOGY AND LARYNGOLOGY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

Chairman: Dr. Fielding O. Lewis, 261 S. 17th St., Philadelphia.
Clerk: Dr. James A. Babbit, 1912 Spruce St., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m. on third Wednesday of each month from October to June.

THE MILWAUKEE OTO-OPHTHALMIC SOCIETY

President: Dr. Charles J. Coffey, 221 Grand Ave., Milwaukee.
Secretary-Treasurer: Dr. Edward R. Ryan, 425 E. Water St., Milwaukee.
Place: University Club. Time: 6:30 p. m. on third Tuesday of each month.

THE MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

Chairman: Each member, in alphabetical order.
Secretary: Dr. M. B. Selingstein, 801 Union and Planters Bank Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.